FEB - 6 1935
MEDICAL LIBRARY

Vol. XV. JANUARY, 1935 No. 59

The Journal of Neurology and Psychopathology

Edited by

S. A. KINNIER WILSON

WITH THE ASSISTANCE OF THE FOLLOWING EDITORIAL COMMITTEE:

EDWIN BRAMWELL
T. GRAHAM BROWN
A. FEILING
R. G. GORDON
J. C. GREENFIELD
C. C. WORSTER-DROUGHT
R. FOSTER KENNEDY
H. G. BAYNES
WILLIAM BROWN
HENRY DEVINE
R. D. GILLESPIE
BERNARD HART
C. STANFORD READ
R. M. STEWART
C. MACFIE CAMPBELL
EDITOR OF THE BRITISH MEDICAL JOURNAL

CONTENTS

Original Papers PAGE

The Chemistry of the Brain in the Mental Defective — W. R. Ashby and Ada Glynn — 193

Symptomatic Epilepsy in One of Identical Twins: A Study of the Epileptic Character — Walter Freeman — 210

A Case of Juvenile Amaurotic Family Idiocy — R. M. Norman — 219

Dinitrophenol in Dementia Praecox — Isidore Finkelman and W. Mary Stephens — 230

The Role of the Cerebral Cortex in Narcolepsy; the Classification of Narcolepsy and Allied Disorders — Max Levin — 236

Editorial
Brain Fever 282

Abstracts 245

Reviews and Notices of Books 271

Occasional Notes 283

ISSUED BY THE BRITISH MEDICAL ASSOCIATION

LONDON: BRITISH MEDICAL ASSOCIATION HOUSE,
TAVISTOCK SQUARE, W.C.1.

Published Quarterly. Subscription 30/- per annum. Single Numbers 8/6 net. Post Free

EDITORIAL NOTICES

THE EDITORIAL COMMITTEE will welcome original articles for publication in the JOURNAL. They should be addressed to *Dr. Kinnier Wilson, 14 Harley Street, London, W.1 (Neurology)*: *Dr. Bernard Hart, 94 Harley Street, London, W.1 (Psychopathology)*: *or to any other member of the Editorial Committee.* The Copyright of papers appearing becomes the property of the JOURNAL unless the authors state before publication that they reserve the rights to themselves.

They also invite correspondence, criticisms, and suggestions from readers, which may aid in the development of the JOURNAL.

Contributions should be as concise as possible, and be forwarded at least six weeks before the date of publication. Papers are best type-written, and carefully revised, since alterations in type are costly. References should be made in the following order :—year—volume—page—and be inserted in brackets in the text where they occur, thus : (BRIT. MED. JOUR. 1912, ii, 579), or given in order at the end of the paper. Where practicable, articles should conclude with a short summary of their contents.

Illustrations.—These, whether plain or coloured drawings, or photographs, should be rendered as perfectly as possible. The Publishers undertake the preparation of the blocks, but not of the originals.

Reprints.—Owing to the present abnormal costs of production, free reprints of articles cannot be given until further notice. If desired they may be obtained by payment, but notice must be given when the proof is returned.

Subscriptions.—30/- net, post free ; single numbers, 3/6 net.

Business Communications and applications for *Advertisement Space* should be addressed :—

THE FINANCIAL SECRETARY AND BUSINESS MANAGER,
British Medical Association,
B.M.A. House, Tavistock Square, London, W.C.1.

Telephone : Norwich 80.

HEIGHAM HALL
NORWICH

Private Home for the care and treatment of a limited number of Ladies and Gentlemen suffering from Nervous and Mental illness.

About two and a half hours from London by express train, L.N.E.R., and in connection with the Midlands by M. & G.N. Line.

The mansion, surrounded by extensive private grounds, is furnished as a private residence, and nothing suggests confinement, the safety of patients being ensured by a large staff of experienced nurses. Any modern therapeutic measures can be undertaken in suitable cases. Private Suites of Rooms with special nursing available.

Voluntary Patients, Temporary Patients and Patients under certificates are admitted for treatment.

Seaside quarters are available when desired, and all amusements conducive to recovery are provided. The Chaplain conducts Service every Sunday, and patients attend the Parish Church.

Fees : From 4 Guineas a week upwards according to requirements.

Vacancies occasionally exist for Ladies and Gentlemen at reduced fees on the recommendation of the Patient's own Physician.

Apply to :
MEDICAL SUPERINTENDENT,
HEIGHAM HALL · NORWICH

FENSTANTON
CHRISTCHURCH ROAD
STREATHAM HILL, S.W.2

A Private Home for the Treatment of LADIES with Mental and Nervous Disorders. 12 acres of Grounds. Homelike surroundings, amusements and occupations.

Apply :
THE RESIDENT PHYSICIAN
Telephone : TULSE HILL 7181

for every kind of
INSURANCE
consult
the
Medical Insurance Agency
(LIMITED BY GUARANTEE)
B.M.A. House, Tavistock Sq.
London W.C.1
Phone : Euston 1871

THE JOURNAL OF NEUROLOGY AND PSYCHOPATHOLOGY

Vol. XV. JANUARY, 1935 No. 59

Original Papers

THE CHEMISTRY OF THE BRAIN IN THE MENTAL DEFECTIVE *

By

W. R. ASHBY AND ADA GLYNN, LEAVESDEN

PAGE

INTRODUCTION 193
PREVIOUS WORK 194
TREATMENT OF BRAINS BEFORE ANALYSIS 194
CHEMICAL METHODS 195
TABLES OF RESULTS 199
ERRORS 200
DISCUSSION OF RESULTS 202
SUMMARY 208
REFERENCES 209

INTRODUCTION

THE work done hitherto on the chemistry of the brain in its relation to intelligence is comparatively small. Most of it has been undertaken to demonstrate chemical differentiation during growth, and for this purpose the material used has been either animal brains both before and after birth, or human brains at various stages of maturity. We have made chemical analyses on 71 brains, 62 of them being from mental defectives and the remaining nine from normal controls. There are several points of view from which the results may be of interest.

1. The studies of many workers have shown that the chemical constituents of the brain undergo systematic changes during the development of the individual. Some results are available for the human brain, and it will be of interest to see whether the mental defective shows changes in the chemistry of his brain which would relate the varying mental ages to the chronological ages of normal children. In other words, it will be of interest

* From the Laboratory of Leavesden Mental Hospital, Abbot's Langley, Herts.

to see whether the defective can be considered to be infantile in his brain-chemistry.

2. Some of the main histological features of the cerebral cortex are very difficult to measure or assess objectively, particularly the richness in cells and the degree of myelinization of the fibres, as it is almost impossible to stabilize the intensity of the staining. Some problems of this type, however, may be answered with greater accuracy and directness by chemical analysis.

PREVIOUS WORK

The sole observations with which we are acquainted on the chemical composition of the brain in the mental defective are those of Tilney and Rosett.[16] In their work, they used 68 human brains which had been preserved in formalin for different lengths of time. Before analysis they were divided into brainstem, right and left cerebral hemispheres, and right and left halves of the cerebellum, but no division was made between white and grey matter. Estimations made to determine the water, lipoid, and non-lipoid values showed that two brains from low-grade defectives were not significantly different from the normal adult brains.

The changes in the lipoids of the human brain during development have been investigated by Schiff and Stransky,[15] Smith and Mair,[14] and Koch and Mann.[11] Their results show that during growth there is a decrease in water content and an increase in lipoids. Similar results have been obtained by several workers using the brains of animals, notably by Koch and Koch,[10] Donaldson,[4] and Backlin.[2] Further Koch and Koch, and Donaldson, working on rat brains, state that the water decrease is in progress before medullation begins, and according to Donaldson the process of medullation is not a controlling factor in reducing the percentage of water in the nervous system. Gorodisskay [7] has done considerable work on the brain lipoids, making the analyses on specific areas, but her work is not connected with development or mental deficiency. Koch and Mann [12] have also shown that no important changes occur in the brain lipoids up to 30 hours after death.

TREATMENT OF THE BRAINS BEFORE ANALYSIS

In collecting a series of brains of mental defectives it has not been possible to examine them in a fresh state, chiefly because of the length of time taken to collect the series. It was also necessary to harden the brains in order to be able to separate the grey from the white matter, since fresh brain tissue is too friable to enable this to be done successfully. All the brains had been kept in 10 per cent. formol saline, which was changed repeatedly. The fact that the brains have been preserved in formalin is certainly disadvantageous, but need not invalidate everything. What we have done is to record the time in formalin for each brain, and then, by using the statistical methods of partial regression, we have analysed out separately the effects of mental age and of time in formalin on each particular chemical constituent.

Thus, in the case of the cerebrosides, we wish to study the relationship between cerebroside content and mental age, the time in formalin being a possible complication which we wish to remove. Fitting the equations for the partial regressions of cerebroside on mental age, and of time in formalin, we obtain the effect of each, independently of what the other is doing. Since the equation gives the effect (if any) of time in formalin on cerebroside, we are able to correct the cerebroside figures to what they would have been had all the brains been in formalin for the same length of time. In this way, although we cannot say what the results would have been had we dealt with fresh brain, yet our results are at least corrected to a standard time in formalin.

It will be seen that while our results are not as satisfactory as analyses of fresh material would be, yet by using these methods of statistical analysis results may be obtained which are valid, subject to the restriction that we are dealing with results corrected to a *standard* time in formalin and not corrected to the fresh state.

On most of the substances formalin appeared to have little or no effect. In these cases our results are probably almost as good as if the analyses had been done on fresh material. The phosphatides, however, are considerably affected. These results will be discussed more fully later in connexion with each particular constituent.

These same 71 brains are also being examined from many other points of view. Since a general description of them is being published elsewhere [1] it is not necessary to repeat here all the data such as sex, age at death, etc.

We cut out a block, about $1\frac{1}{2} \times 1$ inch in size, from the medial surface, anterior to the corpus callosum, of the right hemisphere of each brain. The frontal lobe was chosen as it is commonly considered to be the most interesting region in defectives. A block of this size provides about 8 gm. of grey matter. This is obtained by cutting the block into slices and then carefully trimming off the grey matter. For this purpose we have found a von Graefe cataract knife to be convenient. Some preliminary experiments, done by shaving the cortex into layers, showed that the chemical composition of the cortex remained practically constant as one descended from the surface towards the white matter and that it tended to increase fairly sharply just as one approached the white matter. It is therefore better in dissecting off the grey matter to keep about $\frac{1}{2}$ mm. above the white matter. Losing a little grey matter makes practically no difference, but the inclusion of a small amount of white matter would upset the results considerably.

CHEMICAL METHODS

In most of the analyses described below, the values obtained in each case probably represent a group of compounds rather than a single one. As the group is precisely determined by its method of estimation, this distinction in no way alters the validity of the results, but it is one which must be

remembered. Should the values for any group be significantly correlated with mental age, then that group could be more exhaustively examined. Should no such correlation be found, then its absence refers to the group as a whole.

After the grey matter required had been removed from the brain, it was stripped of any adhering membranes and was washed overnight in running water to remove formalin. It was then ready for drying and extraction.

Water Content.—This analysis was performed in duplicate, and for each estimation 0·3 to 0·4 gm. of the material was used. The brain was superficially dried with filter paper, rapidly spread on to a tared filter paper strip, and weighed. This strip was contained in a weighing bottle and was counterpoised with a similar bottle and filter paper strip. After weighing, both bottles were placed in a vacuum desiccator and the brain was dried to constant weight. Usually two days were sufficient.

From the results of the 71 duplicate estimations the standard deviation and coefficient of variation were calculated. They are : $s = 0{\cdot}532$; C. of V. = 0·64 per cent. (In calculating the standard errors we have used ' degrees of freedom ' according to Fisher's method [5] ; older methods give a figure which seriously underestimates the true error.) These are the errors of the method. Since our final results, however, are the means of two estimations, the error actually affecting our figures will be $s/\sqrt{2} = 0{\cdot}383$.

Drying.—The washed brain was cut into small pieces, and after being superficially dried on filter paper was placed in a vacuum desiccator for one day. The pieces were then finely ground in a mortar and returned to the desiccator until constant in weight. By this method, 8 gm. of material were completely dried in 10 days.

Extraction.—Chloroform was used for the extraction in preference to any of the other solvents which have been more generally employed. It seems more desirable to carry out the extraction with one solvent in which all the known lipoids are soluble than to use a series of solvents such as acetone, alcohol, ether and petroleum ether, each of which dissolves only a fraction of the total lipoids. The objection to using a number of solvents is that these lipoid substances considerably affect the solubility of each other, thus preventing a reliable fractionation. For example, it is well known that although kephalin is ordinarily insoluble in alcohol, it will dissolve in the presence of lecithin. It has also been shown by Maclean [13] that although the phosphatides are insoluble in acetone, lecithin is soluble to a small extent in acetone which contains fatty substances in solution. In view of these complications it was decided to make the estimations without isolation of the groups to be studied. In any case there is not much to be gained by such isolation since the quantities obtained would be too small to weigh and would have to be estimated by indirect methods.

All the estimations were made on 0·8 to 1·0 gm. of dry brain. This was weighed into a 100-ml. CO_2 flask and was extracted with 50 ml. of chloroform.

The flask, fitted with a reflux condenser, was heated in a water bath kept at about 70° C. After three and a half hours the chloroform was filtered through a fat-free filter paper into another 100-ml. flask of known weight. The brain residue was returned to the extraction flask and heated with a fresh quantity of chloroform for five hours. In all, four lots of chloroform were used and the extraction time was 18½ hours. Further extraction was found to be superfluous. After extraction of the brain, the filter papers used were extracted with chloroform for one hour and this extract was added to the main one. During each extraction the chloroform of one was allowed to evaporate down to about 10 ml. by being kept in a water bath at 55°–60° C. After the final extraction the last 10 ml. were allowed to evaporate at room temperature. The extract was then dried in a vacuum desiccator to constant weight. This method possibly requires more attention than the various Soxhlet methods, but it gave very reliable results.

From four estimations on one sample and five duplicate estimations on different samples the standard deviation and coefficient of variation were calculated. They are : $s = 0{\cdot}209$; C. of V. = 0·80 per cent.

Analysis of the Extract.—When its weight had been determined the extract was redissolved in chloroform and made up to 50 ml. From this solution aliquots were used for the determination, in duplicate, of cholesterol, cerebrosides and phosphatides.

Cholesterol.—It was at first intended that the digitonin method should be used as it is more accurate than colour methods and in addition it estimates the cholesterol free from its esters. In practice, however, this method is very slow and tedious, and its accuracy is by no means in proportion to the time required. By making duplicate estimations with the colour method a sufficient accuracy could be obtained in a fraction of the time.

Grigaut's [8] method, based on the Liebermann reaction, was adapted for use as follows : 5 ml. of the extract were diluted to 50 ml. ; to 5 ml. of the diluted solution were added 2 ml. of acetic anhydride followed by 0·1 ml. of concentrated sulphuric acid ; the constituents were well mixed and the colour allowed to develop in the dark for half an hour. The standard for comparison was 5 ml. of a chloroform solution containing 0·00012 gm. of cholesterol per ml., and this was treated in the same way as the sample. After half an hour the intensities were compared in a Bausch and Lomb colorimeter, using a red filter, Wratten ' A,' to eliminate a yellow tint in the brain extract.

From the 71 duplicate estimations, $s = 0{\cdot}189$; C. of V. = 2·93 per cent. Since each of our results is the mean of two estimations, the error actually affecting our results is $s/\sqrt{2} = 0{\cdot}134$.

Cerebrosides.—In the estimation of cerebrosides it is usual, when there is sufficient material, to extract this fraction and weigh directly. With less material there are two methods available. The first [9] consists in hydrolysing with acid and estimating the liberated galactose. In the second method the

cerebrosides are calculated by difference and everything else present in the fraction must first be determined. In this method the total lipoids are estimated on an aliquot part by Bang's [3] chromic acid oxidation method. From the value obtained by this method the previously estimated lipoids are subtracted and the difference is designated as cerebrosides. Clearly this method can only be used when everything in the extract can be estimated. This is not the case in a chloroform extract which contains a number of undetermined fats and waxes. A method involving hydrolysis and estimation of galactose had therefore to be used and a modification of Koch's [9] method was chosen.

Ten ml. of the extract were pipetted into a pyrex boiling-tube of dimensions 15 × 85 mm. and allowed to evaporate to dryness. Eight ml. of 15 per cent. sulphuric acid were added to the residue, which was hydrolysed by heating gently with a micro burner for one hour. A condenser of the hanging glass type was used. To facilitate filtration, 3 ml. of saturated sodium sulphate solution were added and after filtration the solution was neutralized with caustic soda and made up to 50 ml. Five ml. of this were used for the sugar estimation, which was done colorimetrically by the Folin and Wu method. The standard for comparison was 5 ml. of a glucose solution prepared by diluting 2 ml. of a 1 per cent. solution to 1 litre. The values quoted in the literature vary enormously. The results of the present method (mean = 2·42 per cent.) agree quite well with the values found by Smith and Mair [14] by direct weighing (mean = 1·94 per cent.).

From the results of 65 duplicate estimations, $s = 0{\cdot}0666$; C. of V. = 2·70 per cent. Since our final results are the means of two estimations, the error actually affecting the final results is $s/\sqrt{2} = 0{\cdot}0471$.

Phosphatides.—These were determined by estimation of the contained phosphorus. It was assumed for the purpose of calculation that all the phosphorus was present as lecithin. This does not, of course, represent the true circumstances, but that is not important for the present work. Actually the results could have been recorded as phosphorus values.

Three ml. of the extract solution were pipetted into a pyrex boiling-tube of dimensions 10 × 200 mm. After the chloroform had evaporated the residue was incinerated over a micro burner with 1 ml. of concentrated sulphuric acid. When the charring was complete, 1 or 2 drops of nitric acid were added to complete decomposition. When quite colourless the solution was cooled, diluted with water and neutralized with caustic soda using phenolphthalein as indicator. The neutral solution was transferred to a 50-ml. flask and the blue colour developed by the addition of ammonium molybdate and amino-naphthol-sulphonic acid according to the method of Fiske and Subarow.[6] The standard for comparison was a known volume, 2 to 3·5 ml., of a solution of potassium dihydrogen phosphate containing 0·08 mg. phosphorus per ml. The colour developed in about 15 minutes and remained constant for several hours.

From the results of 45 duplicate estimations, $s = 0{\cdot}198$; C. of V. $= 1{\cdot}99$ per cent. Since our final results are the means of two estimations, the error actually affecting our results will be $s/\sqrt{2} = 0{\cdot}140$.

Nucleoproteins.—When the lipoids have been extracted, the phosphorus remaining in the residue may be considered to represent the nucleoproteins and inorganic phosphates. It was intended to estimate the latter by boiling a portion of the residue in water and estimating the extracted phosphorus. In another portion the total phosphorus was to be estimated by incineration as described above for phosphatides. By difference an estimation of the nucleoproteins would be obtained.

For the total phosphorus estimation about 0·05 to 0·06 gm. of the residue was used. This was weighed into a pyrex boiling-tube and incinerated with 1·5 ml. of strong sulphuric acid together with a crystal of potassium sulphate. When colourless, the solution was made up to 50 ml., of which 20 ml. were used for the colour estimation. In attempting to estimate the inorganic phosphorus it was noticed that the water extract became faintly turbid on adding the acid ammonium molybdate solution, and that after adding the amino-naphthol-sulphuric acid no colour developed until about a day had passed and even then it was too faint to measure. Several of the brain residues were extracted, but none contained any appreciable inorganic phosphorus. We have therefore concluded that the inorganic phosphates must have been dissolved out of the brains during their preservation in formol saline, and the total phosphorus itself is taken to represent the nucleoproteins.

The experimental error of estimating protein phosphorus has been measured by performing six incinerations on one sample of brain, and then making two colorimeter estimations on each incineration. By testing in this manner it is possible to analyse out separately the error between incinerations and the error between colorimeter estimations. After calculating the errors, we find the variance between incinerations to be $85{\cdot}2 \times 10^{-6}$, and variance between colorimeter estimations to be $68{\cdot}4 \times 10^{-6}$. We used one incineration and one colorimeter estimation on each of our brains, so the variance of the final result is $85{\cdot}2 + 68{\cdot}4 = 153{\cdot}6 \times 10^{-6}$, giving standard deviation $= 0{\cdot}0124$, and coefficient of variation $= 2{\cdot}82$ per cent.

TABLES OF RESULTS

The results of the analyses are given in Table I.

Contrary to many authors, we are of the opinion that the results for the constituents are best all given in the form of ' gm. of substance per 100 gm. of fresh (undried) tissue.' Our reason for this is that there is no point in working out ratios which are uninterpretable. To be of any use, apart from mere recording purposes, the data must be in a form suitable for interpretation, usually from the physiological point of view. In physiology we are always dealing with living tissues where the water is absolutely as essential and important as, say, the proteins. Consequently, to express one's results as so

much after the water has been eliminated is to give them in a form which corresponds to nothing in nature.

For recording purposes it hardly matters which method is chosen since one may soon convert the figures from any one type to any other.

In Table I are given :—

(A) Patient's reference number. These agree with the other data published elsewhere about the same brains.
(B) Mental age in years.
(C) Water content in gm. per 100 gm. of undried brain.
(D) Total chloroform extract (same units).
(E) Total (dry) residue after extraction (same units).
(F) Cerebrosides (same units).
(G) Phosphatides (same units).
(H) Cholesterol (same units).
(J) Protein phosphorus (same units).
(K) Time in formalin. Here is given $\log_{10}$ (time in months), for reasons furnished later.

ERRORS

There are two separate types of error to be considered : (1) Errors in the chemical analyses, and (2) errors in handling the group results.

1. In the analyses we have to consider first whether the analysis gives the result for all of the substance and for nothing else. As pointed out above, this may be judged from the descriptions of method and need not be considered further.

The second point to discuss is whether the analyses are sufficiently accurate. The accuracy of all the methods has been measured and the errors have been given above in the form of the standard deviation and the coefficient of variation. We have to decide whether the accuracy is sufficient. We have approached the subject on the following lines.

The effect of the errors of estimation is essentially to waste information, e.g. if we examine 71 cases using a method with a certain experimental error, then the final effect, for correlation purposes, is exactly the same as if we had measured a smaller number of cases with infinite accuracy. Now our particular purpose is to establish whether or not there is any significant correlation between mental age and the percentage of substance in question. Should a significant correlation be found between the two variables, then the question of experimental error need not trouble us further since the effect of such errors is to obliterate correlations and it would mean that the correlation had appeared in spite of the errors. On the other hand, should the correlation prove insignificant, we must then inquire how much correlation might be present, for one can never, of course, be sure that there is absolutely no correlation present. But by using a suitable number of cases one can ensure

TABLE I

No. A	Mental age B	Water content C	$CHCl_3$ extract D	Total residue E	Cerebrosides F	Phosphatides G	Cholesterol H	Protein P J	Time in formalin K
1	1	84·4	3·69	12·0	0·348	1·05	1·01	0·0642	1·93
2	1	82·7	4·18	13·1	0·396	1·24	1·12	0·0734	1·86
3	1	82·4	3·62	14·0	0·435	—	0·86	0·0755	1·56
4	3	84·5	3·87	11·7	0·335	—	0·99	0·0671	1·69
5	4	83·6	3·81	12·6	0·396	0·99	0·87	0·0695	1·86
6	4	84·2	3·99	11·8	0·371	1·18	1·10	0·0626	1·91
7	5	82·7	4·40	12·9	0·386	—	1·12	0·0726	1·76
8	5	81·9	4·39	13·7	0·439	1·12	1·25	0·0778	1·80
9	7	85·2	4·08	10·7	—	—	0·92	0·0572	2·01
10	8	83·8	3·89	12·1	0·390	—	0·98	0·0691	1·71
11	9	84·3	3·83	11·9	—	—	0·89	0·0644	1·69
12	1	85·6	3·61	10·8	—	—	0·84	0·0578	2·00
13	5	83·0	3·92	13·1	0·357	0·48	1·01	0·0676	1·92
14	1	83·7	4·10	12·2	0·383	0·89	1·17	0·0697	2·01
15	7	81·7	4·22	14·1	0·376	1·30	1·23	0·0791	1·64
16	3	82·5	4·25	13·3	0·442	1·20	1·21	0·0778	1·59
17	12	83·3	3·85	12·8	0·336	1·11	1·00	0·0726	1·38
18	2	85·7	3·76	10·6	—	—	0·72	0·0656	1·34
19	5	86·2	3·56	10·3	0·322	—	0·91	0·0617	1·45
20	5	84·2	4·18	11·6	0·394	1·42	1·00	0·0684	1·52
21	8	87·0	3·64	9·3	—	—	0·74	0·0579	1·28
22	5	85·8	3·86	10·4	0·344	—	0·90	0·0594	1·34
23	3	84·2	4.06	11·7	0·382	—	1·02	0·0728	1·38
24	3	83·8	4·06	12·2	0·384	1·36	1·04	0·0695	1·51
25	5	84·4	3·95	11·7	0·372	—	0·99	0·0681	1·40
26	5	84·9	4·10	11·0	—	—	0·90	0·0674	1·30
27	6	85·2	3 90	10 9	0·360	—	1·00	0·0665	1·32
28	8	85·3	3·91	10·8	0·415	—	0·98	0·0644	1·38
29	4	83·6	4·14	12·2	0·435	1·23	1·10	0·0763	1·54
30	2	82 7	4·13	12·9	0·456	1·56	1·11	0·0779	1·53
31	2	84 7	3·76	11·5	0·392	—	0·98	0·0688	1·34
32	3	84·3	3·94	11·7	0·402	—	0·91	0·0682	1·40
33	5	85·0	3·86	11·2	0·335	—	1·04	0·0671	1·36
34	9	84·1	3·89	12·0	0·409	—	0·96	0 0727	1·34
35	3	84·8	3·73	11·5	0·312	—	0·80	0·0700	1·30
36	3	84·8	4·06	11·2	0·328	—	0·97	0·0665	1·30
37	4	85·6	3·70	10·7	0·380	—	0·98	0·0632	1·38
38	0	86·2	3·58	10·2	0·282	—	0·91	0·0604	1·38
39	1	83·9	4·05	12·0	0·402	1·46	1·02	0·0694	1·51
40	2	84·1	3·98	11·9	0·435	1·36	1·03	0·0803	1·51
41	4	85·6	3·95	10·4	0·429	1·70	1·06	0·0618	1·46
42	2	84·4	4·17	11·5	0·390	1·55	1·15	0·0676	1·43
43	2	82·5	4·58	12·9	0·464	1·60	1·16	0·0765	1·43
44	6	83·2	4·39	12·4	0·452	1·49	1·21	0·0767	1·34
45	7	83·0	4·47	12·6	0·397	1·42	1·16	0·0713	1·32
46	3	83·3	4·39	12·3	0·358	1·63	1·18	0·0766	1·32
47	5	84·7	3·96	11·3	0·440	1·61	0 84	0·0689	1·28
48	0	84·7	3·76	11·6	—	1·68	0·88	0·0716	1·26
49	3	83·9	3·84	12·3	0·305	1·43	0·99	0·0735	1·26
50	6	84·2	4·14	11·7	0·385	1·58	1·00	0·0778	1·34
51	3	84·1	4·23	11·7	0·400	1·67	1·07	0·0717	1·23
52	8	84·2	4·04	11·8	0·386	1·55	0·96	0·0711	1·30
53	1	82·6	4·60	12·8	0·408	1·76	1·19	0·0765	1·23
54	4	85·6	3·73	10·7	0·347	—	0·93	0·0645	1·15
55	6	83·7	4·35	12·0	0·331	2·13	1·06	0·0810	1·11
56	1	83·8	4·27	11·9	0·377	1·71	1·11	0·0772	1·23
57	3	84·2	4·26	11·6	0·430	1·61	1·05	1·0707	1·26
58	0	85·4	3·91	10·6	0·311	1·69	0·98	0·0643	1·08
59	1	84·2	4·27	11·6	0·402	1·87	1·14	0·0767	0·95
60	9	82·2	5·10	12·8	0·506	2·47	1·18	0·0759	0·90
61	7	82·6	4·86	12·5	0·372	1·88	0·87	0·0768	1·04
62	0	84·8	4·00	11·2	0·337	2·04	1·00	0·0767	0·85
63	14	82·9	4·54	12·5	0·478	1·81	1·25	0·0794	1·04
64	14	84·7	4·80	10·5	0·367	2·61	1·07	0·0563	0·70
65	14	82·1	4·74	13·1	0·575	1·82	1·33	0·0808	1·00
66	14	82·4	4·61	13·0	0·430	1·91	1·16	0·0817	0·85
67	14	82·6	5·04	12·3	—	—	1·21	0·0755	1·11
68	14	84·3	4·54	11·2	0·359	2·75	1·06	0·0650	0·60
69	14	83·0	4·80	12·2	0·518	2·10	1·29	0·0779	0·78
70	14	84·1	4·47	11·4	0·378	—	1·03	0·0785	0·60
71	14	85·6	4·71	9·7	—	2·40	1·06	0·0515	0·78

that if a correlation has not b en demonstrated, then any correlation present must be less than a certain amount. For reasons discussed elsewhere,[1] we

have decided that '$r^2 = 0{\cdot}1$' is a suitable limit for this type of work. We have shown that this limit can be guaranteed provided that the fraction

$$\frac{\text{experimental variance}}{\text{total variance between patients}}$$

does not exceed 0·135. This fraction has not been exceeded by any of our methods. We may therefore conclude that the accuracy of the methods is sufficient.

2. A second source of error, much more important than the above, is the error of random sampling. Our 71 cases are only a sample from the total population of defectives, and samples may have, by chance, all sorts of small peculiarities not present generally. Proper tests of significance, however, will tell how much is properly ascribable to chance, and only if the features exceed this amount can the findings be considered significant. Since, in our case, we wish to test the partial correlations with time in formalin eliminated, we have used Fisher's [5] tables, which are very convenient.

In eliminating the effect of time in formalin, we found that the (partial) regression of phosphatide on time did not appear to be linear. On testing it against $\log_{10}$ (time in formalin), however, the regression became linear. Since it is much easier to calculate and handle linear regressions, we have used the logarithm of the time in formalin throughout. We have examined all the other regressions and have satisfied ourselves that they are reasonably linear.

There is one other source of error which needs mention. Our particular series of cases is biased for epilepsy, in that this condition occurs mostly at the lower end of the mental age scale. In order to make sure that the epileptics were not peculiar in their chemical 'make-up,' we have calculated the residuals of mental age and substance after eliminating log (time) and have then examined the figures for the epileptics to see whether they were in any way different. It is scarcely necessary to give all the figures here, and we may state at once that the epileptics appeared to be just the same (chemically) as the other cases, having regard to their mental age and to time in formalin.

DISCUSSION OF THE RESULTS

We may now proceed to our findings in each substance for correlation between amount of substance and mental age.

Water Content.—The partial correlation between water content and mental age, in our series, with time in formalin standardized out, is $-0{\cdot}358$. This value is well beyond the 1 per cent. point of random sampling and is therefore undoubtedly significant. We can, therefore, be certain that there is some real connexion between the two columns of figures. As far as we can see, there is only one way in which this finding could be fallacious, and that is that there might be some differential effect in formalin. A general shrinkage could not produce a correlation; there would have to be a differential

effect, so that those brains of higher mental age responded to formalin differently from those of lower mental age. By examining a three-dimensional graph of the cases and the interrelations between the three variables, we have satisfied ourselves that no differential response occurs in the period covered by our cases. Any differential response, if it exists, must occur early in the fixation process. The formalin effect is small in any case, the partial correlation between log time and water content, mental age eliminated, being insignificant.

Although the validity of the correlation could only be established

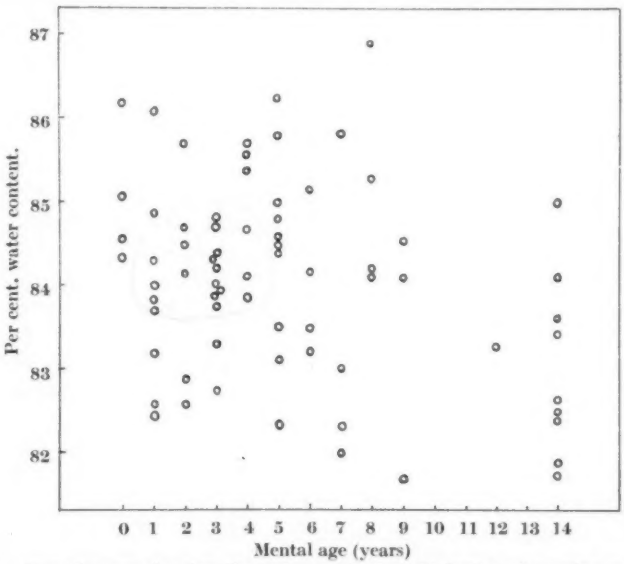

FIG. 1.—Dot diagram showing the water content of 71 brains of varying mental ages. The nine normal cases have been given a mental age of 14. Water content has been corrected for time in formalin.

definitely by reexamining a new series of fresh brains, yet, since one does not usually expect these peculiar effects, we think that there is probably a correlation between mental age and water content of the grey matter.

Fig. 1 shows the 71 cases with water content plotted against mental age. The values plotted for water content are not those of column C in Table I, but have been corrected for the formalin effect so as to display the relation more clearly. Each dot represents one brain.

The partial correlation is negative and this means that as mental age increases, the water content, on the average, falls off. This is certainly interesting, since the same falling off of water content is known to occur quite generally in the development of the brain.[2, 4, 10, 11, 14, 15] The general significance of this change is not known. The fall in water content in normal

development is certainly *not* due, as is commonly supposed, to increasing myelinization, since the water content commences to fall before myelinization commences.[4, 10] It seems to be associated with some much more profound change, possibly in the nature of the proteins of the brain. To study the point further would require further research, but the change is certainly interesting.

Before we proceed to discuss the other results, we must first take account of a complicating factor. As the water content shows a significant correlation with mental age, and as any alteration in one constituent is bound to be accompanied by an inverse alteration in the others, so the other figures must first be freed from the water effect. This we have done by recalculating all the quantities as so much per cent. of dry weight. This eliminates any connexion with the water content and enables us to test for correlations quite apart from the disturbing water variation.

All the subsequent correlations are calculated using per cent. of dry weight.

Extract.—The extract content is undoubtedly affected by time in formalin (the partial correlation with mental age eliminated is — 0·543). The correlation between mental age and extract is insignificant after eliminating the time in formalin effect. This agrees generally with the results of Tilney and Rosett,[16] who analysed two defectives' brains but found no change in the lipoid content. This absence of change is of interest since the figures for extract probably represent ' myelin ' fairly closely. In our series, therefore, there is no evidence of any falling off in myelinization in the lower mental ages. As we mentioned previously, the value of this estimation lies in the fact that it is hardly possible to get at the ' degree of myelinization ' in any other way with reasonable accuracy. The fact that we have found no significant correlation between mental age and amount of extract suggests, therefore, that the mental defective does not differ appreciably from the normal in the degree of myelinization of the grey matter.

Cholesterol.—The cholesterol content of the grey matter appears to have no correlation with mental age, after eliminating time in formalin (the correlation is + 0·078, which is quite insignificant). This, of course, is to be expected with no change in myelin, since cholesterol is one of the main constituents of myelin. Time in formalin appears to have no effect on the cholesterol content (the correlation with mental age eliminated is — 0·192, which is insignificant).

Phosphatides.—Phosphatides are markedly affected by time in formalin (correlation, eliminating mental age, is — 0·852). On eliminating the time in formalin effect, no correlation is found between mental age and phosphatide content (actually the correlation is — 0·077). The phosphatide content, therefore, does not appear to be appreciably changed in the mental defective.

Cerebrosides.—Cerebrosides do not appear to be at all affected by time in formalin (correlation is — 0·051, which is quite insignificant). They show no significant correlation with mental age (actually the correlation is + 0·162,

which is insignificant). This is of interest since in normal development it is the cerebrosides which show the most marked change between birth and maturity. Most of the work has been done on animals, but Smith and Mair [14] find the cerebrosides to increase about 300 per cent. from birth to maturity in man. The change in cerebrosides in normal development is so marked that any reasonable correspondence in our series could hardly be missed. The negative finding, therefore, is fairly conclusive in showing that the mental defective's brain does not correspond chemically with the brain of the normal child.

Phosphatide-cholesterol Ratio.—Since, in many respects, phosphatides and cholesterol have antagonistic physicochemical properties, we have examined the phosphatide/cholesterol ratio in our brains to see if there is any systematic alteration. On testing the correlation of this ratio with mental age (time in formalin eliminated), the correlation is insignificant, indicating no particular change with mental age.

Since this ratio is of particular interest in the epileptics, we have recalculated the P/C ratio, eliminating both mental age and time in formalin, and have examined the residuals to see if the epileptics showed any difference from the non-epileptics. No significant difference was found.

Protein Phosphorus.—On testing the correlation of protein phosphorus with mental age, time in formalin eliminated, we find the correlation to be − 0·386, which is definitely significant.

This is certainly interesting since protein phosphorus represents largely nucleoprotein and the figures given in Table I will be approximately proportional to the amount of nucleoprotein present in the cortex. It appears, therefore, that there is some alteration in the content of nucleoprotein as mental age alters. It will be observed that the correlation is negative, indicating that the higher the mental age the less the amount of nucleoprotein. This is apt to appear surprising at first, since one would scarcely expect mental age to increase as something else falls off, but it must be remembered that we are dealing with ' gm. of protein phosphorus per 100 gm. of dry brain,' i.e. with a *relative* proportion, and what is true relatively is not necessarily true for absolute quantities. If we convert the correlation to give actual values, we find that in going from 0 to 14 years of mental age, the protein phosphorus per 100 gm. drops by 9·2 per cent. while the weight of the cerebrum increases by 9·3 per cent., indicating that the *total* quantity of nucleoprotein remains about constant. It appears, therefore, that the relative amount of nucleoprotein falls off while the total quantity remains constant.

It seems more likely, therefore, that what is really happening is that some other constituent of the brain is increasing with mental age and thus producing a relative diminution in the percentage of nucleoprotein. On considering what other constituents there are which could vary sufficiently to make an appreciable difference to the nucleoprotein, we may note that the lipoids may

be ruled out at once both collectively and individually since they have been tested directly and have shown no significant change. The only other constituent present in sufficient quantity is the 'non-nuclear' proteins. Consequently, we have considered the problem of estimating the non-nuclear proteins to see if we could test them directly for any correlation with mental age. Unfortunately there is no method for estimating them directly. They might possibly be estimated by considering the total protein and subtracting the amount of nucleoprotein, but the values obtained would depend almost entirely on the value chosen for the constant used to turn phosphorus values to nucleoprotein values.

In this connexion we may remember the point mentioned previously, viz. that there is no sense in calculating ratios which are subsequently uninterpretable. But there is one ratio here which is interpretable, and that is the ratio of nucleoprotein to non-nuclear protein. A nerve cell may be considered to be composed of two parts—a nucleus, and a cell-body with fibres (dendrons, axon). The amount of nucleus will correspond fairly closely with the amount of nucleoprotein, while the amount of cytoplasm will correspond approximately with the amount of non-nuclear protein. If the relative amounts of these two parts vary, then the ratio of nucleoprotein to non-nuclear protein will vary. Equally, if the ratio varies, then we may legitimately consider whether the variation could be due to an alteration in the relative proportions of nucleus and the rest of the cell. Further, if one cell had more prolongations than another, while the nuclei remained the same, then the ratio would alter in such a way that we might interpret it as a *relative* falling off in the amount of nucleus.

As we had already found a relative falling off in the amount of nucleoprotein as mental age increased, and as an interesting interpretation could be offered, we decided to test the point directly by calculating the ratio of nucleoprotein to non-nuclear protein to see whether the ratio showed any significant change with mental age.

As explained above, it was not possible to find explicitly the amount of non-nuclear protein, but for testing the ratio from our point of view this does not matter. We have :

$$\text{Total protein} = \text{nucleoprotein} + \text{non-nuclear protein}$$

and since the fraction $\dfrac{\text{nucleoprotein}}{\text{non-nuclear protein}}$ is a function of the fraction $\dfrac{\text{nucleoprotein}}{\text{total protein}}$,* we may use the latter just as well as the former. Both these latter quantities are known directly from the analyses.

---

* $\dfrac{x}{x+y}$ is a function of $\dfrac{x}{y}$ since $\dfrac{x}{x+y} = \dfrac{\frac{x}{y}}{\frac{x}{y}+1}$

Calculating the fraction for each patient and correlating them with mental age, we find the correlation, with time in formalin eliminated, to be — 0·387, which is definitely significant. It is to be noted that this correlation is practically the same as the previous one (— 0·386) when we correlated amount of nucleoprotein with mental age. This is important, since in the fraction used above we have, in effect, divided each nucleoprotein figure by another (varying) figure ; if the non-nuclear protein had really no connexion with the subject, then the introduction of irrelevant figures would have ' diluted down ' the correlation and the final correlation would have dropped considerably. We see, therefore, that there is reason to believe that the non-nuclear protein is playing some definite part in the production of the correlation. Further,

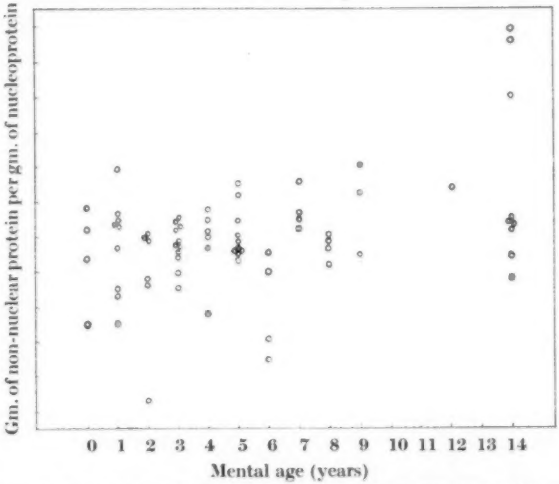

FIG. 2.—Shows ' gm. of non-nuclear protein per gm. of nucleoprotein ' (corrected for time in formalin) plotted against mental age. Each dot represents one patient.

this suggests that the ratio is a more natural method of examining the nucleoprotein-mental age relationship than considering the nucleoprotein by itself.

For purposes of interpretation we may note that the above fraction is equivalent (inversely) to ' gm. of non-nuclear protein per gm. of nucleoprotein.' This quantity is plotted against mental age in fig. 2.

(As will be seen from the argument, the actual values for the vertical scale cannot be given, but this does not affect the subsequent argument.)

The fact that the correlation of this ratio with mental age is significant and positive clearly invites interpretation. As we pointed out above, these two constituents clearly correspond to two natural parts of a cell—the nucleus and the cytoplasm. Consequently we may first draw the provisional conclusion that *on the average, as one goes from* 0 *to* 14 *years of mental age, the*

total amount of nuclear substance in the cortex remains about the same while the amount of cytoplasmic substance increases. This we consider to be little more than a plain statement of fact. It is difficult to think of any other conceivable alternative.

To carry the interpretation a stage further, we are of the opinion that there are two main possibilities :

(*a*) In the development of the brain, the neuroblasts are at first small cells which consist mostly of nucleus with but little cytoplasm. As growth continues, the cells throw out more processes and thereby become relatively less nucleated. Consequently, we can see that our results, in a general way, suggest that the nerve-cells of the defective's cortex correspond, in their relatively diminished cytoplasm, with cells which are only partially developed. We may note also, that if the defective's nerve-cells are held to be immature, then our work suggests that the immaturity shows itself chiefly in the lack of cytoplasm rather than in any alterations in the amount of nuclear material.

(*b*) An alternative explanation which may fit the facts is given by considering the neuroglia. Although there are no accurate measurements available, yet a general histological study of the neuroglia suggests that, on the whole, it tends to have less cytoplasm than the average nerve-cell. Consequently our finding that the defective's cortex is relatively rich in nucleoprotein might be due to an increased proportion of neuroglia in the defectives. The question whether defectives' brains differ from the normal in the amount of neuroglia does not appear to have been systematically investigated, and consequently we cannot decide at present between the two possibilities (*a*) and (*b*). Of course, the two possibilities are not necessarily exclusive ; it is possible that both occur.

To sum up our conclusions with regard to the nucleoprotein figures, our findings suggest that either the nerve-cells of the defective's cortex are immature in form, or that there is an excess of neuroglia present.

SUMMARY

1. We (A.G.) have analysed chemically the grey matter of the frontal lobe of 71 brains, 62 being from mental defectives of varying mental ages and 9 being from normal adults.

2. The cortex has been analysed into : water, total extract, residue, cholesterol, cerebrosides, phosphatides, and protein-phosphorus.

3. In each method the experimental error has been measured and is below certain limits.

4. The brains being fixed in formalin, the conclusions are subject to certain reservations which are discussed.

5. On testing for any alterations with mental age, we find :

(*a*) The water content shows a significant correlation with mental age, the normal brains being drier than the defectives'.

(*b*) The myelin content shows no change with mental age.

(*c*) The constituent lipoids—cholesterol, cerebrosides, and phosphatides—show no change with mental age.

(*d*) The protein-phosphorus shows a significant correlation with mental age, the defective's brains being relatively richer in protein-phosphorus than the normals.

(*e*) Reasons are given for deducing that in the defective either the nerve-cells are immature in form or there is an excess of neuroglia present.

REFERENCES

[1] Ashby, W. R., and Stewart, R. M. (In the press.)
[2] Backlin, E., *Upsala Lak. Forhandl.*, 1930, **35**, 105.
[3] Bang, I., *Mikromethoden der Blutanalyse*, 1922.
[4] Donaldson, H. H., *Jour. Comp. Neurol. and Psychol.*, 1910, **20**, 119.
[5] Fisher, R. A., *Statistical Methods for Research Workers*, 1925.
[6] Fiske, C. H., and Subbarow, Y., *Jour. Biol. Chem.*, 1925, **66**, 375.
[7] Gorodisskay, H., *Biochem. Zeits.*, 1925, **159**, 379; 1925, **164**, 446.
[8] Grigaut, C. *R. soc. biol.*, 1910, **68**, 791.
[9] Koch, M. L., and Koch, W., *Amer. Jour. Physiol.*, 1904, **11**.
[10] Koch, M. L., and Koch, W., *Jour. Biol. Chem.*, 1913, **14**, 281.
[11] Koch, W., and Mann, S. A., *Jour. of Physiol.*, 1907, **36**.
[12] Koch, W., and Mann, S. A., *Arch. Neurol. and Psychiat.*, 1920, **4**, 174.
[13] Maclean, H., *Biochem. Jour.*, 1914, **8**, 453.
[14] Smith, J. L., and Mair, W., *Jour. Pathol. and Bacteriol.*, 1912, **17**, 418.
[15] Schiff, E., and Stransky, E., *Jahrb. f. Kinderheilk.*, 1921, **86**, 245.
[16] Tilney, F., and Rosett, J., *Bull. Neurol. Inst. New York*, 1931, **1**, 28.

SYMPTOMATIC EPILEPSY IN ONE OF IDENTICAL TWINS *

A STUDY OF THE EPILEPTIC CHARACTER

By

WALTER FREEMAN, Washington, D.C.

INTRODUCTION

Twins have thrown light upon many problems in medicine. There are certain diseases that almost inevitably develop in both of identical twins and at about the same period of life, even though the two individuals are living amid different surroundings. This rule applies particularly to nervous and mental diseases, though many other constitutional diseases have been reported as occurring in both of identical twins.† The frequency of identical disorders in dissimilar twins is considerably greater than it is in siblings, but does not approach the figures for identical twins. It is for these reasons that any alteration occurring in one of identical twins is of such importance for the study of the collateral phenomena. For instance, Jenkins [1] recently reported a case in which one of identical twins received a birth injury with consequent choreoathetosis and slowing of mental development. The injured girl was three grades below her twin at school, and presented a difference of 15 points (79–64) in the I.Q. at nine years. The healthy twin was more outgoing, aggressive and responsive, and her weaker sister suffered greatly by comparison. She was so quiet, shy and reticent that testing required twice as long. She was unable to compete successfully with the normal twin in physical activity and when they fought, Lena won. Ida was more responsive to praise.

This pair of twins furnished an opportunity for determining what intellectual and emotional manifestations were due to the cerebral injury and what effects the comparison of the stronger twin with the weaker might have in the subsequent development of the two individuals. Jenkins emphasized the devastating effects of twin rivalry upon the weaker sister (' Ida has no individuality except in her deficiencies ') but he did not report any detailed character analysis of Lena. This is to be regretted, since her injured twin suffered from convulsions in infancy.

* From the Department of Neurology, George Washington University, Washington, D.C. Presented before the American Neurological Association, June 5, 1934.

† For a study of this subject see Wilson, S. A. K., and Wolfsohn, J. M., ' Organic Nervous Disease in Identical Twins,' *Arch. Neurol. and Psychiat.*, 1929, **21**, 477.

TWINS AND EPILEPSY

It is generally agreed that something in the constitutional 'make-up', the X-factor of Lennox and Cobb,[2] is necessary for the development of epilepsy, even in those patients that develop seizures only after cerebral injury. This X-factor must be present in the healthy twin as well as in the epileptic twin, since both of them are developed from the same ovum. The following case of a pair of identical twins, one of whom suffered from a cerebral lesion at an early age with subsequent epileptic attacks, while the other escaped, furnishes important data upon the question whether the so-called epileptic psyche is a primary character deviation, or whether it is secondary to the repeated cerebral insults. Of the two individuals inheriting the same genetic pattern, subjected to the same environment, one suffers an experiment of Nature while the other serves as a control. Such a perfect experiment is seldom realized in human beings. If there is an inherent character defect, an epileptic psyche, it should be present in pure form in the uninjured twin. For once, the study of the healthy individual is just as important as the study of the diseased one. Fortunately, this has been possible. Would epilepsy develop in the healthy twin, should she suffer from a serious cerebral injury later?

Epilepsy in twins is not very frequently reported, but the Rosanoffs,[3] in their superb collection of 1,011 sets of twins with some neurological or psychiatric defect, found 107 cases in which epilepsy affected one or both twins. The distribution of these cases is given in Table 1.

TABLE 1

Epilepsy in Twins—Rosanoff Cases

Type of twins	Number of cases	One affected	Both affected
Monozygotic males . . .	9	4	5
Monozygotic females . .	14	5	9
Same sex, dizygotic males . .	15	12	3
Same sex, dizygotic females .	24	20	4
Opposite sex, dizygotic . .	45	32	13
Totals	107	73	34

There are many important points discussed in this paper, such as vulnerability of the nervous system, prematurity, trauma, sex-linked disturbances, etc., which make it a contribution of the first rank. A discussion of the 'epileptic character,' however, is not included. Three case-histories of epilepsy in one of identical twins are given.

In the 4,280 Swiss epileptics studied by Stroessler [4] there were 45 cases in one of twins, and in the three monozygous cases both were affected. Many

other cases must be discarded because of the early death of one twin, but possibly the author's cases 31 and 38 are instances of epilepsy in one of identical twins. The data concerning trauma and even of homozygosity are incomplete, however, and there is no information concerning the character of the normal twin. Shanahan [5] found 38 out of 8,024 epileptics to have been one of twins, but did not pursue further the question of personality in either the normal or the diseased twin.

The nearest approach to a study of the normal twin is found in Lange's [6] classic monograph, *Verbrechen als Schicksal.* Among his 13 pairs of identical twins both were criminals in 10 instances. Study of the discordant examples reveals indications of cerebral injury occurring to the delinquent twin in two of the three cases, and his Xaver Ball suffered from epileptic attacks during childhood. When these twins were studied, at 50 years of age, Xaver had been imprisoned for 24 years for the murder of his mistress during what appears to have been an 'epileptic equivalent.' The murder was particularly brutal, and was preceded and followed by sound sleep. Xaver was the first born. He had a large hæmatoma that subsided spontaneously. Between two and four years of age he was tossed by a cow and for several years had nocturnal epileptic attacks that finally ceased spontaneously. At the age of 10 he manifested a compulsive orderliness. Somewhat later he fell out of a hayloft to the barn floor, a distance of six metres, was unconscious, and remained in bed for a week. Physical examination upon imprisonment revealed paresis of the right internal rectus muscle, and deviation of the tongue to the left. The brother Johann showed no such defect. Both boys were stupid, one of their teachers saying that even the intellect was equally divided between them. 'They capered like kids on the street. Xaver was less open. The twin brother could talk, was freer, livelier and qualified to play the host, although he was lazier. Xaver, on the other hand, could not talk with people, was monosyllabic, gruff, bristling, but was industrious, orderly, and yet less judicious.' Johann was a farmer of irreproachable character; Xaver had a good prison record.

There is not enough in the published record for adequate character analysis of the healthy twin, and in the affected one the diagnosis of epilepsy is not altogether positive, the convulsive seizures having ceased before adolescence.

The main objection to implicit reliance upon the material in this study for final decision upon the question of the epileptic character is the symptomatic nature of the epilepsy, since some writers are inclined to delineate the epileptic character only in cases of 'essential' epilepsy. Most authors, however, agree that the epileptic character appears equally well in the 'idiopathic' and in the symptomatic cases, provided the damage to the brain is not of such degree as to interfere seriously with the other cerebral functions. Even Clark [7] states that these patients with symptomatic epilepsy take refuge in narcissism, that the injury is a wound to the ego's sense of well-being,

that energy is withdrawn to swell the bubble of self-satisfaction and that there is an inbinding of tension within the ego. The attacks, originally due to the lesion, become automatic discharges of this tension.

THE EPILEPTIC CHARACTER

The epileptic character has been subjected to study by many investigators. Clark [8] states: '. . . there is invariably present an epileptic constitution or make-up in those individuals who later develop essential epilepsy. The nucleus of this personality defect is a temperament of extreme hypersensitiveness and egotism and all that these two main characteristics entail.' These traits make the possessor incapable of social adaptation. The seizure, Clark maintains, is due to the sufferer's inability to subordinate his individualistic tendencies to social demands. The patient reacts by periodic unconsciousness.

Characterizations of the epileptic personality are many and various, but most authors do not specify, as Clark does, that the deviations are already present in the preconvulsive era. White [9] views the epileptics as a group as morose, irritable, suspicious and hypochondriacal. Kretschmer [10] terms them coarse, brutal, tense, explosive, abrupt, and inclined to affective crises. Doolittle [11] in a recent study emphasizes the irritability, the supersensitiveness, the religiosity and the narcissism, and says that epileptics are rather subject to outbursts of rage. He cautions against accepting this delineation without reserve, however, since this type of reaction is by no means universal in epileptics, while it also occurs in individuals that have never had convulsive seizures. A somewhat different attitude is maintained by Shanahan,[5] who explains much of the behaviour of the epileptics as a response to anxiety and apprehension concerning the attacks, and to breaking down of the morale of the epileptic due both to the restrictions placed upon him and to the attitude of society. Turner [12] likewise believes that the behaviour of the epileptic is conditioned by his disease rather than existing as a primary defect. Since epilepsy sets in, usually, at an early and impressionable age, the childish reactions persist, while in the case of older individuals the morale is broken down. Doolittle emphasizes the fact that the character alterations in epilepsy, the egocentricity, the irritability and the 'absent' attitude increase as deterioration progresses, until the whole personality is extinguished and the patient deteriorates to the vegetative level of existence.

From the above excerpts it is apparent that there is no uniformity of opinion as to just what constitutes the epileptic personality. Many of the phenomena may well be secondary to the epilepsy, conditioned by the repeated cerebral insults. The fact that epileptic deterioration is not highly correlated either with the severity of the individual attacks or with the number of attacks is beside the point, since in a study of personality it is not deterioration but the original endowment that is under consideration. This original endowment, it is repeated, is the fundamental consideration, and while some

impression may be gained from detailed study of the pre-epileptic personality, there is always a great deal of gratuity in the erection of an adult personality upon the remembered childish traits. Taking as the point of departure Clark's delineation—narcissism and supersensitiveness—one might add certain other traits that may or may not depend upon the epilepsy, such as rigidity of thought and character, pedantry, religiosity; finally superadding such traits as seem definitely to spring from the disease of the brain, such as irritability, furors, suspiciousness and anxiety, lack of interest and forgetfulness. The subjoined study of twin sisters may well show which of the above characteristics are primary and which are secondary.

CASE REPORT

Twin sisters (termed Patient and Sister) are now 25 years of age. Both of them have unmistakable similarities, not only in physique, colour of eyes and hair, texture of skin, shape of ears and hands, but also in tone of voice, a peculiar fluttering of the eyelids and marked readiness for tears to flow on slight provocation. Finger-prints are almost identical. There was a single placenta. Patient is 3 cm. shorter than her sister, slightly lighter, is left-handed and her hair grows counter-clockwise. Sister's hair grows clockwise and she is right-handed. Both of them have followed an exceptionally similar career, attending convent school, then becoming telephone operators, voluntarily returning to different convents at different times and finally leaving again to resume work at the switchboard. Both of them are married, Patient to an Army sergeant, the other to an ex-Marine sergeant, and neither has children. The father died accidentally, the mother suffers from diabetes, and an older sister died of typhoid fever. There is no history of epilepsy, mental defect or psychosis, migraine or urticaria in the family.

Patient weighed 5½ lb. at birth, a pound less than Sister, was the second to come—a rapid, normal vertex presentation. Her face was enclosed in the membranes but the cord was not round the neck. She cried lustily, and nursed normally, as did Sister. Both developed normally to the age of eight months, when, during very hot weather, and in the course of a digestive upset, Patient had several convulsions. Sister escaped. From this time on it was noticed that Patient was somewhat less vigorous than Sister, talking and walking two months later. She was less responsive, a little flabby. They were devoted to one another, tending from the beginning to shut out childhood friends and even other members of the family. Sister was the leader, showed more initiative and more stamina, and was able to get along better with other children. Patient followed her lead but often assumed the observer's rôle while Sister was playing with other children. In primary school they kept pace, but Patient was rated lower in the class than Sister. There were fights and arguments, but no real twin rivalry is remembered. Sister felt superior to Patient, but Patient did not feel inferior to Sister. They shared the same bed and each masturbated for a year before finding out that the other was doing likewise. Neither of them was forward with other children, Patient showing less initiative and poorer judgment in her choice of companions. Sister had a much more lively fantasy life, telling tall tales that had a profound effect upon her impressionable but less alert twin. At one period they played hermit and alternately prayed and tilled the soil in the back yard, subsisting on cold canned beans. Once they spent many hours in a church where the sacrament was exposed, praying and expecting Christ to appear before them. At the age of seven Patient began to suffer from two or three attacks of petit mal a week, but no severe attacks.

Patient contracted typhoid fever at the age of nine, her older sister dying of the disease, her twin escaping the infection. On this account Patient lost a whole year

of schooling. After the illness it was noticed that the right leg was smaller and did not develop as rapidly as the left, so that she limped to a trifling degree. Soon thereafter, both girls were placed in a convent. They were deeply religious, and enjoyed the peace and routine of convent life. They matured within two months of one another. Upon leaving the convent, at different times, they both became telephone operators. The reaction of the girls to their work was decidedly different, however. Patient was quite satisfied to go along with the routine of completing calls, while Sister was irritated by the monotony, harrassed by the constant repetition of the same manœuvres, and finally gave up her position to re-enter the convent. Patient continued for a while, but at the age of 17 she accepted an invitation of two men in an automobile, was taken to the outskirts of the city and raped. She developed pyosalpinx, requiring operation, and shortly thereafter voluntarily entered a different convent intending to become a nun. She seems to have accepted the raping as an unfortunate and disagreeable occurrence, but her self-respect was not upset by it.

Neither twin found the expected peace of mind in the convent. Patient was distressed to find that the sisters had human failings, and that the other girls were quite worldly-minded, while Sister had unwittingly immured herself in a home for wayward girls, and had to escape by stratagem. Sister resumed her telephone job until Patient left the convent, resigning for her sake to become telephone operator in an affiliated hospital. Patient has continued to work as night telephone operator in this hospital until the present time, enjoying the opportunity thus offered to read a rather high type of fiction and philosophy and to indulge in inconsequential conversation with the nocturnal prowlers about the hospital. Sister used her spare time to assist in clerical work, took a course in laboratory technique, and is now senior technician.

Patient married two years earlier than Sister a somewhat coarse type of individual with whom she had relations before marriage, accompanied by mingled distress and pleasure. Sister's husband is also a rather gross individual who frequently embarrasses her in public. Both of them have had some difficulty in adjusting to marriage. Patient runs her establishment methodically, does much of the work, pays the bills. Sister shares the work and responsibility with her husband, and is a better housekeeper. Sister is probably more highly sexed than Patient. Sister avoids pregnancy while Patient desires it greatly on the grounds of her religious beliefs. Patient is still a devout Catholic and is distressed at the attitude of Sister. Sister's experience at the convent left her quite bitter against the Catholic church. When she married, however, she sought help in this direction. When this was denied because her fiancé was divorced she joined the Reformed Catholics, and has taken an active interest in theosophy. From the standpoint of religiosity, I gain the impression that both are deeply interested, and that the divergence of views is conditioned by varying experiences, but that Sister has been more aggressive in seeking a satisfactory outlet for her devotional sentiments.

Study of the two sisters from the standpoint of personality is rather easy. Both are very open and free in the discussion of intimate details. Each sees in the other a number of traits that differ from her own. Each thinks the other egotistical. Probably both are affected in much the same degree, but Sister has more accomplishments to her credit. Patient is rather easy-going, preferring to give in, even though she knows she is being imposed upon, rather than assert herself. Sister is self-assertive, jealous of her position in the laboratory, somewhat difficult to manage, preferring to force others to conform to her ideas. Sister makes up her mind quickly and acts upon it; Patient is docile. Sister imposes her will upon Patient with little regard to the niceties of situations. Patient usually represses her reactions to disagreeable events, while Sister flares up and gets it over. Patient stores up her dislikes, and occasionally goes into a rage with tears of vexation. Patient is deeply affected by beautiful music, works of art, scenery. One day she told with great disgust how, while she was admiring

the scenery, her husband seemed interested only in the legs 'and other things' of passing women. Quite frequently while engaged in contemplation of some pleasurable experience, Patient has a petit mal attack. Sister is more matter-of-fact, enjoys things without losing herself in them, and is more interested in people than Patient is. Patient admits the superior abilities of Sister, and acknowledges that she has made good use of her time, but mentions the fact that she supplied the money for Sister to take her laboratory course and has not been repaid. She feels that she has grown in moral stature, while Sister has fallen away, since leaving the convent. Of the two, Sister has greater feelings of inferiority when comparing herself with other people. Sister's devotion to Patient is quite touching. With tears in her eyes she says: 'I'd do everything in my power to teach Mary all I know. You don't realize how close to each other twins can be. She is part of myself. Yet I know she can't do the things I can; she hasn't got it in her.'

Intellectually, and despite restricted educational opportunities, Sister gives the impression of being more alert and capable, while Patient is rather dull. The dullness is probably due partly to lack of appreciation of external things, partly to preoccupation. Patient has little curiosity. She takes her spells rather calmly, follows directions implicitly, telephones frequently to report progress, keeps methodical notes on her diet, fluid intakes, and time, location and incidents pertaining to the seizures. Her conversation is notably lacking in sparkle.

Psychometric examinations were carried out by Dr. Thomas V. Moore, to whom I am indebted for the following findings. The tests were made in 1925 when the girls were 16½ years of age.

	Patient	*Sister*
Binet-Stanford	13 years, 6 months	14 years, 8 months
I.Q.	82	92
Healey A	14 seconds	23 seconds
Rating	16 years plus	16 years
Mare and foal	15 seconds	46 seconds
Rating	15 years plus	8 years plus
Knox cube	8 seconds	8 seconds
Rating	16 years	16 years
Seguin form board	19 seconds	26 seconds
Rating	15 ,,	20 ,,
	15 ,,	18 ,,
	11 years	9 years
Writing	Clear, legible, less regular than Sister	Well formed, clear, spelling perfect
Reading	Third reader fluently with expression	Third reader fluently with expression
Arithmetic	Mistakes with change at $1.00. Prompt with multiplication table	Prompt in making change up to $5.00

Patient has had only one major seizure. This occurred during hot weather following a petit mal attack. The head and eyes were drawn to the right, and the convulsion, at first limited to the right side, later became generalized. There was no foaming, biting of the tongue, or involuntary evacuation, and only slight cyanosis. Following the convulsion, she rose, walked across the room, bumped into the sofa, slept all day and awoke late at night with headache and confusion. Examination the next day revealed slight weakness of the right side of the face. The right hand was somewhat smaller and more hypotonic than its fellow, weaker in the grip, but not noticeably slower in fine rapid movements. Reflexes and sensibility were normal in

the two hands. The abdominal reflexes were not obtained on the right. The patellar and achilles reflexes were increased on the right, with ankle clonus and a positive Babinski sign. This foot was smaller and shorter than its fellow, and the sense of position was slightly impaired in the great toe.

Previous examinations by two competent neurologists had discovered no abnormalities in the reflexes, and subsequent examinations over a period of several months have not revealed the signs that were present at the first examination, except for the smaller size of the right hand and foot. Both of them seem to be altogether equivalent to their fellows on the left, and there is no noticeable limping in walking. As already noted, Patient is left-handed.

COMMENT

The underlying process is probably ancient cortical scarring, presumably due to cortical venous thrombosis coincident with the first convulsive seizures in infancy. Petit mal attacks occurred before the typhoid fever, but the shortening of the right lower limb was noted only subsequent to this. While petit mal attacks continue at the rate of about two a week, only one major seizure has occurred in all the subsequent years. Only following this attack did the characteristic neurological signs appear. Sensory Jacksonian attacks without loss of consciousness have recently developed, alternating with the petit mal attacks, or coming in little showers. The paræsthesias begin about the right corner of the mouth and extend to the right hand and foot.

The character traits possessed in common by these two young women appear to consist of rather marked egocentricity and a deep religious feeling. Both of them are probably more sensitive than the average, and both of them have attained an adequate intellectual level.

Whether religiosity should be included among the signs of the epileptic character is debatable. Küffner's [13] study seems to indicate that it is a conditioned response; he cites experiences in Soviet Russia where epileptics are no longer God-fearing. He finds one epileptic out of four to be 'religious,' believes that the primary egocentric attitude with pedantic colouring is responsible, and that in other epileptics devotion to the theatre or to art may be a different expression of the same character trend. The early religious training of these two young women, their mother being a convert to Catholicism, might well have instilled a profound devotion in them. It is of interest that the tendency remains in Sister though the expression has changed, while in Patient, in spite of disillusionment, intense devotion remains unaltered.

Differences in the sisters are easily recognized because of the possibility of ready comparison with one another. Patient may be said to react to her cerebral disorder by less initiative, satisfaction with self and surroundings, performance by rote, interest in her inner experiences. She suppresses immediate reactions and treasures up a load of emotionally charged material that may later break down in an episode of sustained irritability and stubbornness, or explosive resentment. She exhibits slowing-up of intellectual processes; and, finally, petit mal attacks. Patient has a more rigid personality than her sister, is less willing to experiment in either thinking or acting,

shows poorer judgment in her contacts with others, and is less self-assertive, preferring to suffer imposition rather than stand on her rights.

CONCLUSIONS

The differentiation between primary and secondary manifestations of the epileptic character is made possible by the study of identical twins, one of whom had suffered a cerebral injury in early life with little neurological defect and no deterioration.

Egocentricity is the outstanding feature. In the normal twin this has led to considerable accomplishment in spite of educational handicaps, while in the affected individual it has led to satisfaction with self and surroundings. Supersensitiveness is even more marked in the normal twin than in the patient.

The question of religiosity is not altogether determined by this study on account of the strong and early training of both individuals.

All other phenomena that are not more or less directly correlated with the egocentricity would seem to be secondary to the disease. Such character traits as mental and physical inertia, performance by rote, explosive reactivity, suspension of affect, unproductivity and inelasticity of intellectual processes would seem to depend upon the damage sustained by the brain accompanying either the original trauma, or the repeated insults of petit mal.

Sibling rivalry as a cause of stunting of the personality does not appear to be a prominent feature in this pair of identical twins.

REFERENCES

[1] JENKINS, R. L., and GLICKMAN, E., 'Cerebral injury at birth to one of identical twins,' *Amer. Jour. Dis. Child.*, 1934, **48**, 130.

[2] LENNOX, W. G., and COBB, S., *Epilepsy*, 1928.

[3] ROSANOFF, A. J., HANDY, L. M., and ROSANOFF, I. A., 'Etiology of epilepsy with special reference to its occurrence in twins,' *Arch. Neurol. and Psychiat.*, 1934, **31**, 1165.

[4] STROESSLER, G., 'Statistische Erhebungen über Krankheitsursache und Krankheitsbeginn bei Epileptikern, mit besonderer Berücksichtigung epileptischer Zwillinge,' *Schweiz. Arch. f. Neurol. u. Psychiat.*, 1933, **32**, 115.

[5] SHANAHAN, W. T., 'Epilepsies; etiology and symptomatology,' *N. Y. State Jour. Med.*, 1930, **30**, 1359.

[6] LANGE, J., *Verbrechen als Schicksal: Studien an kriminellen Zwillingen*, 1929. English translation by CHARLOTTE HALDANE, '*Crime and Destiny*,' 1930.

[7] CLARK, L. P., 'What is the psychology of organic epilepsy?' *Psychoanalyt. Rev.*, 1933, **20**, 79.

[8] CLARK, L. P., 'Clinical studies in epilepsy,' *Psychiat. Bull.*, 1916, **1**, 61, 131; 1917, **2**, 483.

[9] WHITE, W. A., *Outlines of Psychiatry*, 1930.

[10] KRETSCHMER, E., *Medizinische Psychologie*, 1930.

[11] DOOLITTLE, G. J., 'Epileptic personality—its progressive changes among institutional cases,' *Psychiat. Quart.*, 1932, **6**, 89.

[12] TURNER, W. A., 'Observations on epilepsy,' *Jour. Neurol. and Psychopathol.*, 1927, **7**, 193.

[13] KÜFFNER, 'Über die Frommigkeit der Epileptiker,' *Zeits. f. d. g. Neurol. u. Psychiat.*, 1929, **119**, 17.

A CASE OF JUVENILE AMAUROTIC FAMILY IDIOCY

By

R. M. NORMAN, Stoke Park Colony

INTRODUCTION

Since the original description in 1903 by Batten [1] of a juvenile type of amaurotic family idiocy the main clinical and pathological features of this variant of the condition have become well established. Recently, Sjögren [2] has shown in an analysis of 59 affected families that its inheritance is determined by a single recessive Mendelian factor. The various types of amaurotic idiocy named clinically according to time of onset as infantile, late infantile, juvenile and adult, differ essentially in the composition of the lipoids which are characteristically present in the neurones. The diminishing severity and more protracted course of the symptoms manifested in the older patients are matched pathologically by a gradation in the composition of the lipoids ranging from the prelipoids of the infantile forms to the complex substances closely resembling normal lipochrome found in the juvenile and adult cases. The importance of these lipoid changes has been accentuated in recent years by the discovery of the occasional association of infantile amaurotic idiocy with a widespread lipoid histiocytosis (Niemann-Pick's splenohepatomegaly) and it is still a matter of controversy whether the main ætiological factor in amaurotic family idiocy rests on a primary disorder of lipoid metabolism rather than on a primary neuronal degenerative process. Before such problems can be elucidated it is evident that more observations will have to be made, and since the following case presents many interesting features I have thought it worthy of record.

For permission to publish these clinical and pathological notes I am indebted to Professor R. J. A. Berry, the Director of Medical Services at Stoke Park Colony.

CLINICAL ASPECT

The patient, a female, age 14 years and two months, was admitted to Stoke Park Colony in April 1930. The records state that she was an illegitimate child of a woman reported as being of poor mentality. The mother subsequently married and by the second union has had seven unaffected children. The patient made little progress at school, although actually reaching Standard IVb. On admission to the Colony she was more or less helpless, having to be dressed and washed. On examination she was found to be partially blind in both eyes, light perception only being present. Both optic discs were atrophic, with very small arteries. There was slight peripheral pigmentary change. No macular pigmentation was present. There was an error of refraction of + 3·5 in both eyes. The Wassermann reaction of the blood was negative. Apart

from loss of power, examination of the nervous system showed no striking abnormality. Speech, however, was monotonous and indistinct and there was occasional incontinence of urine. Her mental age was estimated at about six years by a modified Binet-Terman test. Physical measurements at this time showed an all-round reduction from normality. Thus the cubic capacity of skull as calculated from Lee's formula No. 14 was 1,251 c.c., which is normal for a child of 10 years of age. Standing and sitting stature was retarded by two and three years respectively. Right and left grips were extremely poor (12 kilos and 8 kilos) as was her vital capacity of 1,100 c.cm. Her weight of 39·6 kilos, however, was within the range of normal variability for her age.

Towards the end of 1930 the patient developed epileptic fits, and for the next two years her history was one of slowly progressing physical and mental deterioration. The blindness never became absolute. Little change was observed in the periodicity of the epileptiform convulsions, which appeared in short bouts once or twice a month. In September 1933, being unable to get about even with assistance, she was admitted to the chronic ward of the Colony Hospital. Here she led a vegetative existence for the remaining seven months of her life, almost blind, speechless, but occasionally noisy, generally immobile and apathetic, but retaining a voracious appetite to the end. Bronchitis and hypostatic congestion of the bases of the lungs soon appeared, the latter condition being the precipitating factor in her terminal illness. Death occurred on April 18, 1934, at the age of 18 years and three months. The skull was injected with formol saline solution through the orbits immediately after death, and an autopsy was made about four hours after death.

MORBID ANATOMY

1. *Macroscopic Appearances.*—Both bases of the *lungs* were deeply congested but not consolidated. A remarkable degree of adiposity was displayed in many parts of the body.

The *heart*, which was small, showed extensive fat-deposition in the subepicardial region. The cardiac muscle was pale and abnormally friable. Fatty deposits were present beneath the endocardium, especially over the mm. papillares and upon the tricuspid valve.

The *liver* also showed fatty changes. It was slightly enlarged with somewhat rounded edges. The cut surface was pale in colour with a faint yellowish tinge. The *spleen* was normal in size, very dark and friable. The *kidneys* appeared normal. The *uterus* was infantile.

An accumulation of fat was found under the epicranial aponeurosis. There was a general excess of fat throughout the peritoneal cavity. The *thyroid gland* was very small.

The *calvaria* was thick and the diploë almost absent in places. The *dura* was adherent to the skull over the posterior part of the superior sagittal sinus. The brain and cervical spinal cord were removed, and after blocks had been taken for fixation in ammonium formol bromide were suspended in formol saline. The whole brain seemed firmer to the touch than is usual for fresh specimens. The cerebral convolutions showed a slight degree of atrophy which was most marked in the frontal lobes. The sulci in this region showed abnormal widening in both hemispheres.

On the *right side* the central sulcus was bifid at both extremities, neither

of the upper prolongations reaching the mesial surface of the hemisphere. The fissuring of the external part of the parietal and occipital lobes was most irregular (fig. 1). A short intraparietal sulcus $\frac{3}{4}$ inch in length (*a*) ended a transverse sulcus (*b*) which apparently represented the transverse occipital sulcus although lying anterior to the parietooccipital fissure (*c*). The latter was continued over the external surface of the hemisphere and intersected the upturning end of the superior temporal sulcus (*d*). This abnormal

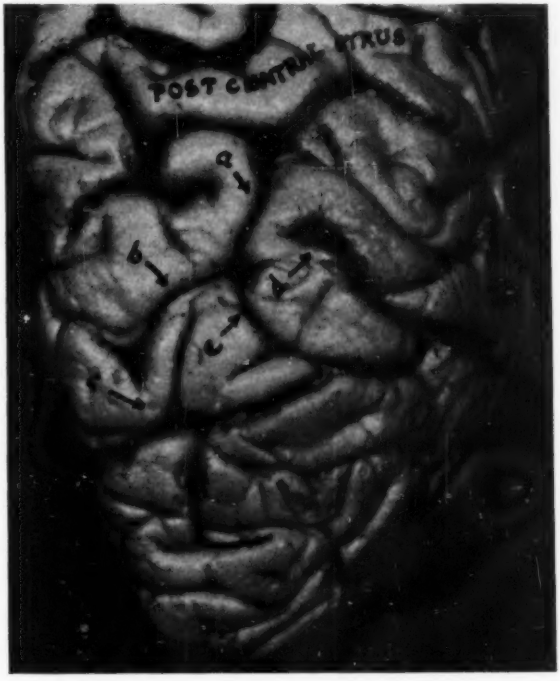

FIG. 1

transverse continuation of the parietooccipital fissure was joined above by a prolongation of the intraparietal sulcus (*e*), and below by the upper extremity of a well-marked lunate sulcus. The frontal lobe was microgyric and its frontal operculum very poorly developed, a small part of the insula being visible. Its V-shaped lower boundary was separated from the Sylvian fissure by a sulcus $\frac{1}{2}$ inch long.

On the *left side* also the occipital lobe was most unusually convoluted. The parietooccipital fissure divided into two terminal branches on the mesial surface of the hemisphere. The lower of these appeared in the normal

manner for a short distance upon the convexity. Between these two terminal branches, however, a deep sulcus took origin and pursued a curved course on the external surface of the occipital lobe, finally dividing itself into two parts —one part passing downwards in lunate formation to the occipital pole, the other passing upwards and nearly reaching the upturned end of the superior temporal sulcus. The superior temporal sulcus, instead of ending in an angular gyrus, passed inwards to terminate in the lower part of the intraparietal sulcus. The intraparietal sulcus, as on the right side, ended in a transverse occipital sulcus which lay level with the upper branch of the parietooccipital fissure. Other abnormalities present were a poorly developed superior temporal gyrus and a small frontal operculum bounded—as on the right side—by a Y-shaped sulcus.

2. *Microscopic Appearances of Nervous System.*—Frozen sections were prepared from nine different areas of the left cerebral cortex, from thalamus and subthalamic area, midbrain, pons, upper and lower medulla and cervical spinal cord. The cerebellar cortex was also examined. The following staining methods have been employed :—

(1) For Nissl's bodies—toluidin blue.
(2) For neurofibrils—Bielschowsky's method.
(3) For astrocytes—Cajal's gold sublimate, Hortega's silver carbonate and Holzer's method.
(4) For microglia—Hortega's method and modifications.
(5) For myelin—Anderson's modified Kulschitsky-Pal method.
(6) For lipoids—Scharlach R, Nile blue, osmic acid and the method of progressive mordanting.

(*a*) *Changes in the Neurones.*—Low-power views of the various regions examined showed that little apparent cell destruction had taken place. The cortical areas presented the familiar cytoarchitectural peculiarities usually associated with imbecility, viz. a poorly developed third layer of pyramidal cells and poverty of granular cells. While it is true that the general arrangement of cells was somewhat distorted by the characteristic swelling of the larger neurones, the impression given was that of a badly developed cortex and not a normal one in a degenerate condition (fig. 2A).

Under higher magnification the typical neuronal changes found in juvenile amaurotic idiocy were observed, namely, pear-shaped swelling of the cytoplasm due to the lipoid aggregations pushing the healthy part of the cytoplasm, nucleus and neurofibrillæ to a peripheral part of the cell (see fig. 2B, 2C, and 2F. These changes were found with great uniformity in all the regions examined, the ganglion cells of the thalamus being the most obviously affected. In the cervical spinal cord one could distinguish an occasional large ventral horn cell in which the changes were minimal. In the cerebral cortex there seemed to be little evidence of any sites of predilection on the part of the disease-process. The majority of the Betz-cells showed little swelling, the lipoid aggregations being small and closely

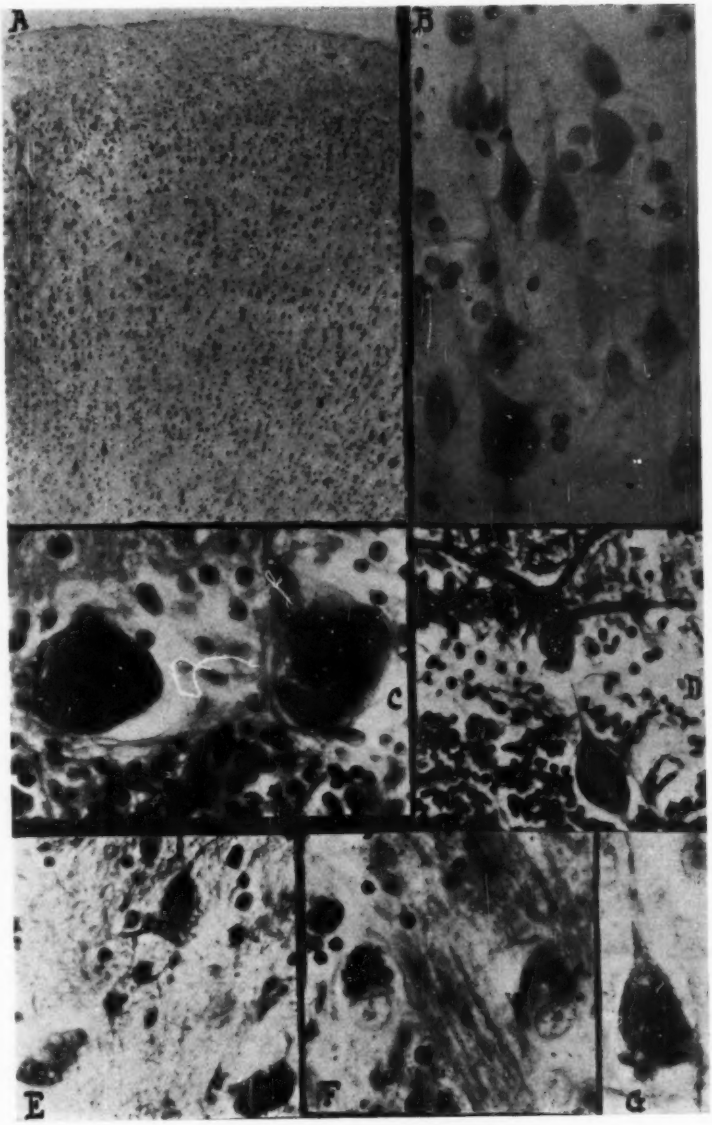

FIG. 2

resembling the lipochrome deposits in senile brains. In the occipital lobe the stria of Gennari was well preserved, and in general this region presented none of the disorganization which characterizes the late infantile form of amaurotic idiocy. In Bielschowsky preparations the affected portion of the cytoplasm usually stained as a granular detritus (fig. 2G, and fig. 4B). Occasionally, however, as in the thalamus (fig. 2E), a reticulated appearance was given. No swelling of the axons was observed outside the cerebellum.

In the *cerebellum* the folia of the superior surface showed little reduction in the numbers of Purkinje cells, though here and there cells were represented as mere shadows. Most of the cell-bodies and many of the dendrons (fig 3A), were distended. In the more atrophic folia of the lower surface, especially near the vermis, far fewer Purkinje cells were in evidence. Axonal ballooning was occasionally observed (fig. 2D). The granular layer was well preserved. In Bielschowsky preparations the neurofibrillæ appeared in the form of a thick bundle pushed to one side of the distended cell-body (fig. 2C). Only rarely could the basket fibres be demonstrated around the less affected cells.

(*b*) ***The Nature of the Lipoid Content.***—In the cerebral cortex and cerebellum the lipoid was usually present in a uniformly staining mass, while in the thalamus and substantia nigra it had a granular distribution (fig. 2F). The latter appearance was associated in Bielschowsky preparations with a reticulated formation in the cytoplasm. In the subcortical white matter small aggregations staining an intense red with Scharlach R were occasionally seen. In unstained sections the lipoid deposit of the larger neurones showed as faint yellow. Toluidin blue stained it a greenish-blue colour, Scharlach R a yellowish-orange (in the thalamus a distinctly redder shade) and Nile blue a deep blue colour. Negative results were obtained with osmic acid after 24 hours' chromication and with the progressive mordanting method using Anderson's modification of the Kulschitsky-Pal stain and examining sections daily up to seven days' mordanting. The lipoid was extremely resistant to solvents and could be demonstrated after 24 hours' immersion in acetone, ether and chloroform and even after rapid treatment with hot xylol.

(*c*) ***Changes in the Neuroglia.***—In the cerebral cortex slight degrees of subpial gliosis were commonly present, especially in the more atrophic frontal convolutions, where long strands of hypertrophic glial fibres were present in the superficial layer (fig. 3D). Regressive rather than proliferative changes, however, were more in evidence. In sections stained by Cajal's gold sublimate method a condition closely resembling that found in senile brains was observed, viz. an increase in the size of the cell-body, delicate vascular feet and wavy processes (fig. 3C). Silver impregnation methods gave a somewhat different picture, a different sort of cell being brought into prominence. In these sections the nucleus of the cell was often pyknotic and the processes took the form of club-shaped expansions (fig. 3F). Another type of glial cell was often found liberally distributed in the superficial parts of the molecular layer of the cerebral cortex (fig. 3E). Here so-called amœboid

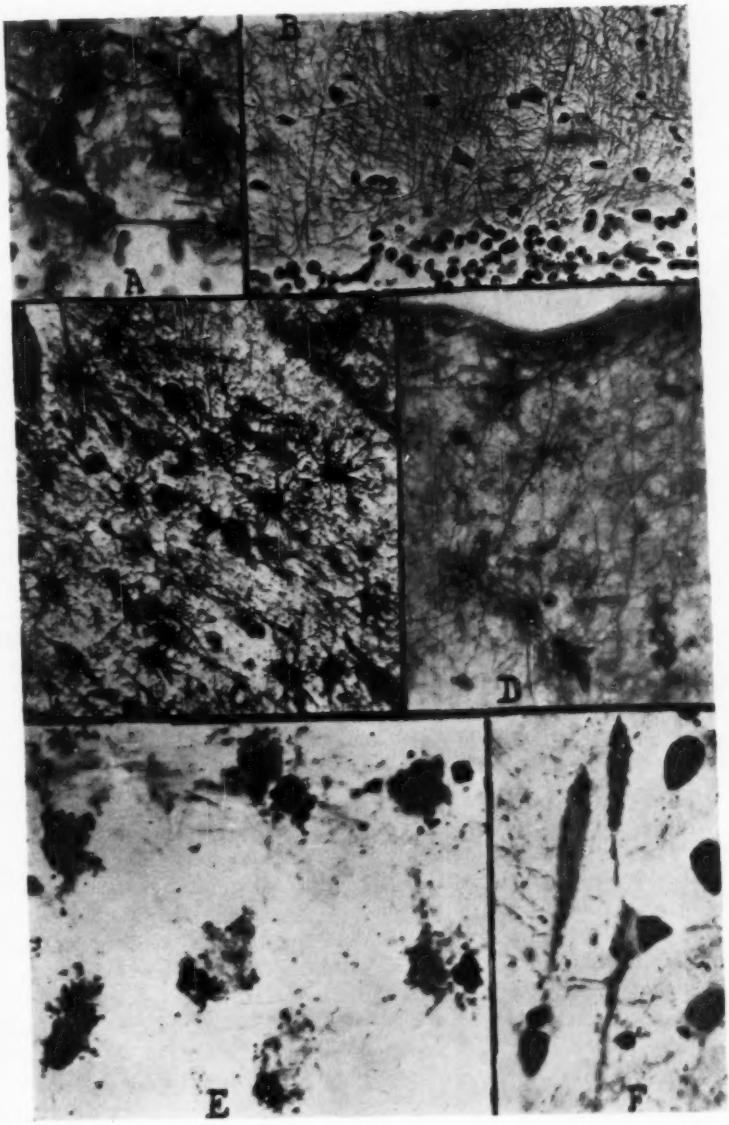

FIG. 3

changes were present, consisting of a retraction of the processes and great increase in the size of the cell-body. Again there is a resemblance to a senile state. Lipoid stains were taken up very feebly or not at all by these glial cells. In the thalamus, however, granules staining red with Scharlach R were present around the glial nuclei.

In the thalamus and molecular layer of the cerebellum (fig. 3B) there was considerable overgrowth of glial fibres in the form of long leashes or bundles. A tendency to subpial fringing in the latter organ could often be made out in Holzer preparations.

(*d*) *Microglia and* '*Mulberry*' *Cells.*—Microglia cells of elongated bipolar form were present in the cerebral cortex. These rod-cells showed varying degrees of swelling and retraction of their processes (fig. 4D, 4E and 4F), and in some areas, especially the occipital, seemed to be represented as the plume-like formations illustrated in fig. 4A.

The so-called mulberry cells which have been described in cases of juvenile amaurotic idiocy were frequently seen in sections stained by Hortega's method for microglia. They were most common in the frontal association area, and all types of transitional forms were present from single cells simulating compound granular corpuscles (fig. 4C) to the lobulated formations which have given rise to the designation 'mulberry' (fig. 4B). This resemblance to microglia cells has been noted by Globus,[3] who explains their vacuolated appearance as due to the disappearance of their original content after treatment with fat-dissolving reagents. In my sections they did not stain with Scharlach R with the intense red colour of compound granular corpuscles, so whatever their content may be, it is not a prelipoid.

(*e*) *Myelin Sheaths.*—There was a poverty of super- and inter-radial fibres in the cerebral cortex, but the picture did not differ from that usually found in imbecile brains. No tract degeneration was found in the cervical spinal cord.

DISCUSSION

In discussing recorded cases of juvenile amaurotic idiocy Greenfield and Holmes [4] suggested that two main types could be distinguished—those in which the cerebellum was particularly involved and those in which the cerebellum and rest of the nervous system were equally affected. Their own case belonged to the former group and exhibited gross general atrophy, much gliosis and great reduction in the cells of the granular layer. In this classification it would appear that the case described in this paper falls into the second group, for the cerebellum was normal in size and its granular layer well preserved. It may well be that the typical ballooning of dendrons and axons shown by the Purkinje cells, which was not found in other parts of the nervous system, is due to an inherent susceptibility on the part of these cells to react in this manner, for similar changes are encountered in senile dementia and other diseases.

The lipoid content of the cells closely resembles in staining reactions

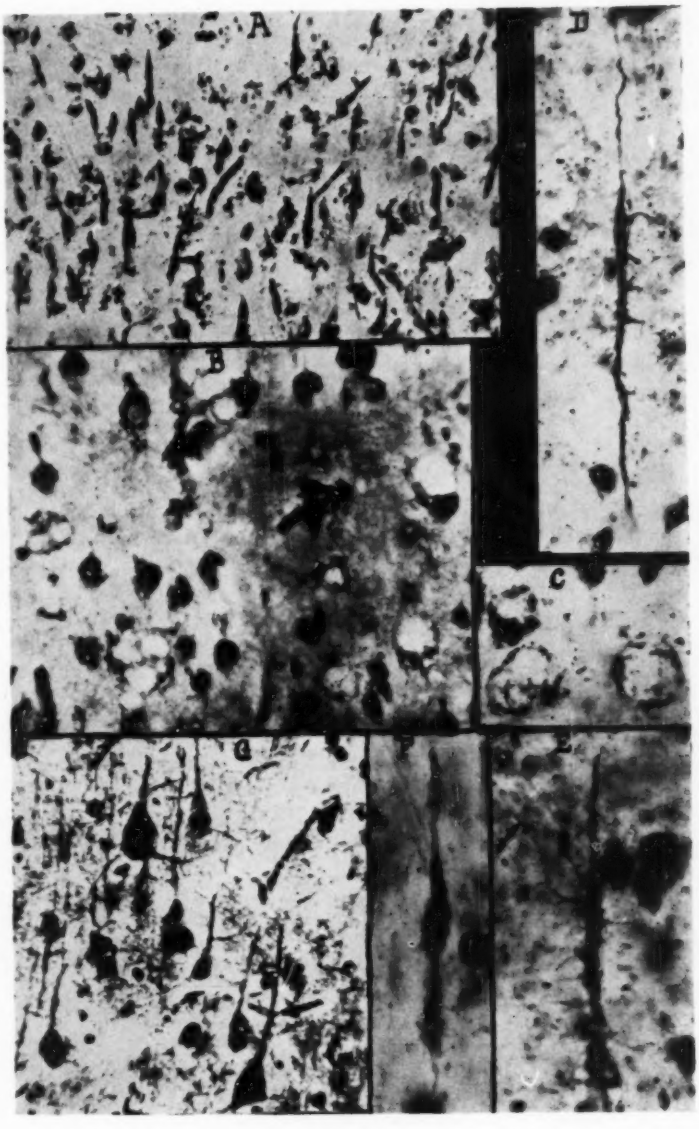

FIG. 4

that found by Hurst,[5] who examined in detail Greenfield and Holmes's material. It differs mainly in the fact that Hurst was able to demonstrate poorly stained granules after four days' mordanting by the Kulschitsky-Pal method. He formed the opinion that the lipoid present was a mixture of phosphatides and cerebrosides. The lipoid granules in the thalamus of my case stained a deeper red than the more diffuse orange-red deposits in the cortical neurones, though they showed no other difference in solubility or staining reaction. This intenser red colour of the thalamic cells is usual, according to Hassin,[6] in the late infantile or Bielschowsky-Jansky type of amaurotic idiocy. Such minor variations in the lipoid as are shown in this case are to be expected, for—as Bielschowsky [7] has pointed out—the precise composition of the lipoid seems to vary in each affected family.

Another feature worthy of emphasis was the state of adiposity found at the autopsy. This was all the more remarkable in a clinical condition often associated with ultimate marasmus. In the introduction to this paper I have noted that theories of the pathogenesis of amaurotic family idiocy have recently been modified owing to the discovery of Niemann-Pick's splenohepatomegaly, a condition in which the infantile form of amaurotic idiocy is associated with a widespread lipoid histiocytosis. The view now held by Bielschowsky, Sachs and others is that the pathological changes both in the nervous system and elsewhere are due to a primary disturbance of lipoid metabolism. The present case of juvenile amaurotic idiocy is, therefore, of peculiar interest, for it presents evidence of lipoid abnormalities outside the nervous system. On the other hand, the clearly abnormal fissuring of the cerebral cortex, especially in the parietooccipital region, is entirely in keeping with the conception of a hereditarily determined cortical agenesia. Such unmistakable evidence of irregular prenatal cortical growth is the usual finding in the imbecile and idiot brains of primary aments.[8] It would appear that a compromise is necessary between the two extremes of opinion on the point whether the causative factor in amaurotic idiocy is primarily neuronic or lipoidal in character. The following quotation from Globus sums up the position excellently :—

> 'It is now commonly accepted that no sharp line can be drawn between the chemical composition of the cell and its morphology ; one is dependent on the other. It is also agreed that regressive morphological alterations may be provoked by an inadequate provision of constructive cell material essential for normal cell growth. Thus is it not probable that cells poorly endowed with constructive material may, at some critical moment in their life, when exposed to some unfavourable condition, be arrested in the process of growth ? With their development so interrupted and brought to a stop, it is quite conceivable that regressive changes may set in and these may show apparent similarities to alterations revealed in processes of degeneration.'

EXPLANATION OF FIGURES

Fig. 1. The external surface of the right occipital lobe.

Fig. 2. (*a*) Frontal association area (F.D.). Toluidin blue. × 48.
(*b*) Superior parietal lobule (P.E.). L III. Toluidin blue. × 360.
(*c*) Cerebellum. Two Purkinje cells. Bielschowsky's stain. × 450.
(*d*) Cerebellum. Swelling of axon of Purkinje cell. Bielschowsky's stain. × 270.
(*e*) Thalamus. Bielschowsky's stain. × 450.
(*f*) Thalamus. Scharlach R and haematoxylin. × 360.
(*g*) Precentral gyrus (F.A.). A medium pyramidal cell. Bielschowsky's stain. × 600.

Fig. 3. (*a*) Cerebellum. Swelling of dendrons. Bielschowsky's stain. × 450.
(*b*) Cerebellum. Overgrowth of glial fibres in the molecular layer. Hortega's silver carbonate method. × 270.
(*c*) Superior parietal lobule (P.E.). Infragranular cortex. Astrocytes of senile type. Cajal's gold sublimate method. × 270.
(*d*) Area peristriata (O.A.). L I. Overgrowth of glial fibres. Hortega's silver carbonate method. × 450.
(*e*) Frontal association area (F.D.). L I. 'Amœboid' glia. Hortega's method for microglia. × 1,000.
(*f*) Precentral gyrus (F.A.). Regressive changes in the astrocytes. Hortega's method for microglia. × 600.

Fig. 4. (*a*) Area peristriata (O.A.). L III. Microglia in the form of deeply impregnated rod-cells. Hortega's method for microglia. × 270.
(*b*) Frontal association area (F.D.). 'Mulberry' glia. Hortega's method for microglia. × 360.
(*c*) As in (*b*). Glial cells simulating compound granular corpuscles. × 270.
(*d*) Rod-cells from parietal cortex. Cone and Penfield's modification of Hortega's microglia method. × 800.
(*e*) As in (*d*), showing slight retraction and swelling of the processes. × 1,000.
(*f*) Rod-cell from precentral gyrus (F.A.), showing more advanced swelling of the processes. Hortega's method. × 1,000.
(*g*) Frontal association area (F.D.). Bielschowsky's stain. × 270.

REFERENCES

[1] Batten, F. E., *Trans. Ophthalmol. Soc.*, 1903, **23**, 390.

[2] Sjögren, T., *Hereditas*, 1930, **14**.

[3] Globus, J. H., Penfield's *Cytology and Cellular Pathology of the Nervous System*, 1932, **3**, 1177.

[4] Greenfield, J. G., and Holmes, Gordon, *Brain*, 1925, **48**, 183.

[5] Hurst, E. W., *Brain*, 1925, **48**, 1.

[6] Hassin, G. B., *Histopathology of the Peripheral and Central Nervous System*, 1933, 316.

[7] Bielschowsky, M., Penfield's *Cytology and Cellular Pathology of the Nervous System*, 1932, **1**, 178.

[8] Berry, R. J. A., and Norman, R. M., *Jour. Neurol. and Psychopath.*, 1934, **14**, 289.

DINITROPHENOL IN DEMENTIA PRÆCOX *

By

ISIDORE FINKELMAN AND W. MARY STEPHENS, ELGIN, ILLINOIS

OBSERVATIONS of the effect of dinitrophenol on patients with dementia præcox should prove of value in (1) determining the reaction of these patients to its therapeutic use, and (2) extending our knowledge of this new drug. Cutting, Mehrtens and Tainter,[1] and Tainter, Stockton and Cutting,[2] have reported their observations of the action of alphadinitrophenol. Therapeutic doses cause an increase in metabolism, and with it a loss of weight without fever. The indifference and lack of spontaneity in dementia præcox, we thought, offer a rational basis for the use of a drug which stimulates metabolism. Hoskins and Walsh,[3] among others, have reported that the rate of oxygen consumption in schizophrenic patients is below normal. During the progress of our work Masserman and Goldsmith [4] reported their observations of the effects of dinitrophenol on 'eighteen patients whose psychobiologic status was characterized by sluggishness, passivity and apathy.' The mental changes in their patients had occurred within the previous year.

TECHNIQUE

Twelve female patients with dementia præcox of the hebephrenic type were selected for this investigation. They ranged in age from 19 to 63 years, and in weight from 135 to 197·5 lbs. All of them had been in the institution from two to 24 years, except two, who had been here six weeks and seven months respectively. All of the group except one refused to do any work. One of the patients was deteriorated to the point of being a 'soiler.' With the exception of one who is employed in industrial work, all were uncooperative in varying degrees at the beginning of the treatment. Co-operativeness increased as the study progressed. Six were given a preliminary period of attention, with the hope of securing better co-operation. In this group we were able to get reasonably accurate oxygen consumption rates † on four before medication was started. Of the patients who had not received a preliminary period of attention, we obtained satisfactory readings on two. None of the patients suffered from any gross organic disease. Blood pressure,

* From the Elgin State Hospital (Charles F. Read, Managing Officer) and the Department of Nervous and Mental Diseases, Northwestern University Medical School, and the Department of Nervous and Mental Diseases, Rush Medical College.

† We have adopted the term 'Oxygen Consumption Rate,' as proposed by Hoskins, to replace 'Basal Metabolic Rate.' We still use the standard notations of plus and minus.

pulse, temperature, respiration and weight were noted, prior to medication, daily during medication, and during the first few days after medication was discontinued.

No laboratory work was done on two of the patients, as it was thought that the increased attention incident to the frequent tests might be a factor in any mental improvement that might result. The patients had to be promised various rewards in order to gain their co-operation. Our conversation with the patients (previous to and during the various tests) might be a form of psychotherapy. Therefore, these two patients were not given any attention by us and served as controls for the effect of psychotherapy. The nurse administered the drug to them and also weighed them daily and took temperature readings.

Oxygen consumption rates were obtained prior to medication on ten patients. Blood chemistry studies and blood counts were made on six patients and urinanalysis on four, before medication was started. Eight patients were given daily, in divided doses, 100 mg. (1·5 grains) of sodium dinitrophenol. The dose was gradually increased to 270 mg. per day. Four patients were started with 60 mg. alphadinitrophenol per day, which was gradually increased to 300 mg. The dosage was not increased to the maximum if the weight loss was rapid on a small dose. Only one patient was not placed on the maximum dosage because she lost weight rapidly on the initial dose. No change was made in the diet which the patients had previously received.

After medication was started, oxygen consumption rates, blood chemistry, including icteric index, cholesterol and blood counts were determined periodically on all patients except the two controls. In addition to daily notations of weight, blood pressure, temperature and pulse, daily observations were made of skin changes, perspiration, gastric distress, spontaneous complaints and mental status.

Seven of the patients were on treatment for 60 days and four for 30 days. Medication was discontinued in the case of one patient at the end of 32 days because the oxygen consumption rate had increased to plus 66. Blood chemistry studies were continued for several days after treatment was discontinued. Weights are still being recorded to determine the permanence of the weight reduction. Oxygen consumption rates were determined every two to four days after treatment until a normal reading was reached.

REACTIONS OF PATIENTS WITH DEMENTIA PRÆCOX TO DINITROPHENOL

The average oxygen consumption rate before treatment was 11·28. The average increase in the oxygen consumption after four weeks of treatment was 37·16. The range of increase was from 21 to 57. Two patients who had been on the maximum dosage (270 mg.) had not increased their oxygen

consumption nor had they lost any weight. Both of these patients had obvious endocrine dysfunction. They were obese, with a hypopituitary type of fat distribution, and had been diagnosed as cases of hypopituitarism. They had fat pads about the pelvis and shoulder girdles and none below the elbows and knees. The average oxygen consumption rate for the entire group two weeks after the completion of treatment was 6·5. This was somewhat lower than the pre-treatment rate, but the co-operation of the patients at this time was considerably better and they approached more nearly basal conditions. The pre-treatment determination was felt to be higher than the true rate. We felt that the oxygen consumption rates had returned to the pre-treatment values.

The average loss of weight per week for the group was 1·44 lbs. Two of the patients mentioned above, who had obvious endocrine dysfunction, had not lost any weight. The range of weight loss was from 2·50 to 0·7 lbs. per week. One patient lost a considerably greater amount (2·5 lbs. per week) than any of the others. This patient was the only one whose dose was not increased to the maximum. She lost weight rapidly on only 100 mg. sodium dinitrophenol daily.

The non-protein nitrogen of the blood was increased from the pre-treatment values on all patients. The average increase in non-protein nitrogen after four weeks of treatment was 2·66 mg. per 100 c.c. The range of increase was from 9·0 to 0·3 mg. In the patients who were on treatment for 60 days, the average increase from the fourth to the eighth week was 8·3 mg. The non-protein nitrogen had not returned to the lower pre-treatment values when determined two weeks after completion of treatment.

In the determination of the icteric index, the colour due to dinitrophenol, which is a dye closely related to picric acid, was removed with dilute hydrochloric acid. We found an average increase of 6·6 in the icteric index. Two weeks after the drug was discontinued the values decreased. The average decrease was 4·56. The Van den Bergh reactions on all patients were negative.

The blood cholesterol [5] was lowered in all patients during treatment and was increased again after the drug was discontinued.

We observed no significant changes in pulse rate, blood pressure, temperature, respiration and cellular constituents of the blood. Urinanalysis was consistently negative. One patient had a gastrointestinal disturbance. This patient showed the greatest mental improvement and her case is reported in detail below.

Mental Reactions.—One patient, whose case is reported, showed definite improvement in spontaneity, sociability and interest in work. Two patients improved in general behaviour, interest in personal appearance and in their tasks in the occupational therapy class. Two patients showed slight improvement. One of the patients who noticeably improved was a case of hypopituitarism and did not respond to dinitrophenol with any change in weight

or oxygen consumption rate. The two patients who had not received any attention with the administration of the drug, and thus served as controls for any incidental psychotherapy, did not show any change from their pre-treatment behaviour. The remaining four patients (three of whom were the oldest of the group) showed no change.

CASE REPORT

M.C., a single white girl, was admitted to Elgin State Hospital on March 2, 1934. She is the oldest of three siblings and had three years of high school. The family history is without significance. She was always quiet, had few friends, and rarely associated with the opposite sex. Fifteen months prior to admission she lost interest in school and preferred to stay in bed. She gradually became more and more careless of her appearance and lost interest in household tasks. She slept poorly and thought someone was coming through the wall to stab her. Several days prior to admission she became acutely disturbed, tore off all her clothing, fought with her mother, and tried to run out of the house in a nude condition. In the hospital she was found to be extremely indifferent and apathetic. When stimulated too much she became very irritable and unco-operative. She neglected her personal appearance, had no spontaneous speech, and rarely answered questions.

After six weeks of observation she was placed on dinitrophenol therapy and incidentally received considerable daily attention. Her weight at the beginning of treatment was 141 lbs. After one week she was co-operating fairly well for all tests, and after two weeks joined an occupational therapy class. But there was no significant change in her behaviour until at the end of the third week of treatment, when she began to show some spontaneity and took noticeable interest in the class work. She has maintained this improvement, with slight progress, as shown by increased sociability and requests for more difficult work in the occupational therapy department.

The laboratory findings in this case were as follows: Oxygen consumption rate prior to medication was plus 12. After treatment for two weeks it was plus 26; two weeks later, plus 33, and after 40 days it was plus 60. After this oxygen consumption rate was determined (60 in air), the patient was placed in a tub of cold water at 58° F. (as subject of another type of experiment). Her oxygen consumption rate in water was 68. Blood chemistry determinations prior to treatment were as follows: Icteric index, 7·5; cholesterol, 207·67 mg. per 100 c.c. of blood; non-protein nitrogen, 27·8 mg. per 100 c.c.; hæmoglobin, 95 per cent. After two weeks of treatment icteric index was 6·1; cholesterol, 146·1 mg.; non-protein nitrogen, 27·5; and blood sugar, 81·63. After four weeks of treatment icteric index was 16·6; Van den Bergh test negative; cholesterol, 117·5; non-protein nitrogen, 29·5; sugar, 86·2; and hæmoglobin 88 per cent. At the end of treatment icteric index was 13·3; Van den Bergh test negative; cholesterol, 119 mg.; non-protein nitrogen, 36 mg.; sugar, 67·4 mg. Two weeks after treatment was stopped, icteric index was 10; Van den Bergh test negative; cholesterol, 175 mg.; non-protein nitrogen, 29·1 mg.; sugar, 78·50 mg.; and hæmoglobin, 78 per cent. Urine examinations and blood counts made from time to time were normal. Her average loss of weight per week was 1·75 lbs.

At the end of the fourth week of treatment she had a gastrointestinal disturbance consisting of nausea and vomiting. She was given larger quantities of water and a mild cathartic. Symptoms disappeared in 24 hours. There was no change in her usual pulse, temperature, respiration, and blood pressure, which were, respectively, 81, 98·8, 20, and 106 systolic and 70 diastolic. No change was made in the medication.

COMMENT

In the interpretation of the reactions of dementia præcox patients to dinitrophenol, it seems to us that any variation in response from that previously published may be due to a difference in reaction to the drug of these patients from that of normal individuals. One can attribute a difference in reactions to the drug from those of normal individuals to the fact that dementia præcox patients differ from others not only in the mental sphere, but also in physical organization. The presence of a constitutional basic factor, anatomic, chemical, constitutional or glandular, has been reported by numerous authors.[6] A difference in reactions may be due to an inefficient mechanism for homeostasis. The physicochemical reactions consisted of an increase in non-protein nitrogen and icteric index and a decrease in blood cholesterol. Although the icteric index and blood cholesterol showed a tendency to return to the pre-treatment values, the non-protein nitrogen remained increased (two weeks after completion of the treatment). The non-protein nitrogen values were, however, within normal limits.

Toxic effects to contraindicate the use of this drug were not observed. The previously reported toxic reactions were due to (1) excessive initial dosage,[7, 8] and (2) allergic reactions.[9] (See Addendum, p. 235.)

It is of great significance that two patients with obvious endocrine dysfunction (hypopituitarism) failed to respond to dinitrophenol with increased oxygen consumption or loss of weight. The reported action of the drug is that of direct stimulation of cellular metabolism.[1] We cannot explain the mechanism of the inhibition of the metabolic response in these two patients, and further work is necessary.

Included among the five patients who improved mentally was one of the endocrine cases who had not responded physiologically to the drug. Two patients who were not given any increased attention did not show improvement. This would suggest that the drug was not the agent that caused improvement, but rather that the increased attention served to stimulate these apathetic patients. It is still a question whether the reported subnormal oxygen consumption rates[3] are causative of or consecutive to the disease. Moreover, it is only by inference that one concludes that the metabolism of the rest of the body as well as that of the central nervous system is stimulated. The other phase of the problem is the availability of oxygen. With toxic doses the blood becomes anoxæmic.[10] The reactions of patients with dementia præcox to the administration of dinitrophenol plus oxygen should be of interest. The use of these two agents as a therapeutic experiment in dementia præcox is also suggested by the reports[11] of short lucid intervals in patients with catatonic dementia præcox which follow the administration of oxygen, or a mixture of oxygen and carbon dioxide.

SUMMARY AND CONCLUSIONS

The mental and physical reactions to the administration of dinitrophenol in 12 patients with dementia præcox were observed. The average increase in oxygen consumption rate was 37·16. The average loss of weight was 1·44 lbs. per week. Two patients with a hypopituitary type of fat distribution did not respond to dinitrophenol with either a loss of weight or increased oxygen consumption. The oxygen consumption rates returned to the pre-treatment values after the administration of the drug was discontinued. The non-protein nitrogen and icteric index increased and blood cholesterol decreased during treatment. The icteric index and the cholesterol showed a tendency to return to pre-treatment values, but the non-protein nitrogen remained increased. Five patients improved mentally. The increased attention given the patients during treatment cannot be ruled out as having been the chief agent in causing the mental improvement. The reactions of dementia præcox patients to the administration of dinitrophenol together with oxygen should be studied.

REFERENCES

[1] CUTTING, W. C., MEHRTENS, H. G., and TAINTER, M. L., 'Actions and uses of dinitrophenol,' *Jour. Amer. Med. Assoc.*, 1933, **101**, 193.

[2] TAINTER, M. L., STOCKTON, A. B., and CUTTING, W. C., 'Uses of dinitrophenol in obesity and related conditions,' *Jour. Amer. Med. Assoc.*, 1933, **101**, 1472.

[3] HOSKINS, R. G., and WALSH, ANNA, 'Oxygen consumption ("Basal metabolic rate") in schizophrenia,' *Arch. Neurol. and Psychiat.*, 1932, **28**, 1346.

[4] MASSERMAN, J. H., and GOLDSMITH, H., 'Dinitrophenol: Its therapeutic and toxic actions in certain types of psychobiologic underactivity,' *Jour. Amer. Med. Assoc.*, 1934, **102**, 523.

[5] MYERS, VICTOR C., *Practical Chemical Analysis of Blood*, 1924, 129–130.

[6] LEWIS, N. D. C., *The Constitutional Factors in Dementia Præcox*, 1923.

[7] POOLE, F. E., and HAENING, R. B., 'Report of case with autopsy,' *Jour. Amer. Med. Assoc.*, 1934, **102**, 1141.

[8] TAINTER, M. L., and WOOD, D. A., 'A case of fatal dinitrophenol poisoning,' *Jour. Amer. Med. Assoc.*, 1934, **102**, 1147.

[9] FRUMESS, G. M., 'Allergic reactions to dinitrophenol,' *Jour. Amer. Med. Assoc.*, 1934, **102**, 1219.

[10] TAINTER, M. L., *Dinitrophenol*, Lecture delivered at Northwestern University Medical School, March 12, 1934.

[11] (*a*) LOEVENHART, A. S., and LORENZ, W. F., 'Cerebral stimulation,' *Jour. Amer. Med. Assoc.*, 1929, **92**, 883.

(*b*) KELMM, H., 'Observation in catatonia with mixtures of carbon dioxide and oxygen,' *Psychiat. Quart.*, 1932, **6**, 513.

Addendum :—After this article had been prepared there appeared reports of cases of agranulocytosis following the administration of dinitrophenol. One of the cases terminated fatally. (Silver, S., 'A New Danger in Dinitrophenol Therapy,' *Jour. Amer. Med. Assoc.*, 1934, **103**, 1058).

THE ROLE OF THE CEREBRAL CORTEX IN NARCOLEPSY; THE CLASSIFICATION OF NARCOLEPSY AND ALLIED DISORDERS

By

MAX LEVIN, Harrisburg, Pennsylvania

Physicians writing on the anatomical substrate of narcolepsy have focussed their attention on the sleep centre thought to exist in the neighbourhood of the third ventricle. Relatively little consideration has been given to the possible rôle of the cerebral cortex. I shall try to show that, so far as this problem is concerned, consideration of the cortex is of great importance.

Even if we had not the advantage of Pavlov's work on inhibition, it would be evident that the cortex has something to do with sleep. If there is any truth in the universal assumption that the cortex is the organ with which we comprehend, reason and initiate voluntary movements, then, since these functions are (with insignificant exceptions) in abeyance during sleep, one must conclude that during sleep the cortex is in a state of inactivity. Pavlov's work, showing that sleep is a state of cortical inhibition, clinches this conclusion.

When one falls asleep, then, it is the cortex which, so to speak, 'falls asleep.' I do not deny that there is a sleep centre. For the sake of argument I shall assume there is. But I submit that it would be one-sided to consider sleep from the standpoint of only the sleep centre.

What is the functional relation of the sleep centre to the cortex? The answer can only be surmised. It seems probable that the sleep centre helps to regulate the frequency, duration and depth of sleep. It probably does not *cause* sleep. Sleep must be *caused* by the fact that cortical cells, in consequence of their activity, become 'fatigued,' whereupon inhibition supervenes to restore them to normal irritability. Perhaps the sleep centre in some way neutralizes the effects of fatigue, thereby prolonging wakefulness and increasing the efficiency of the cortex as an adaptive instrument. Perhaps, on the other hand, the centre acts in the opposite direction by increasing the effects of fatigue, thereby diminishing any possibility of the destruction of cortical cells from overwork. Which, if either, of these guesses is correct is a question with which, in this paper, we need not be concerned. I shall only assume that the sleep centre in some way regulates the frequency,

duration and depth of sleep, emphasizing again that sleep is a state of the cortex and not of the sleep centre.*

If this assumption be granted, it follows that there is no compulsion to regard *all* cases of morbid somnolence as due to a perturbation of the sleep centre; *some* cases *may* be due to perturbations of the cortex. An analogy may be seen in cases of inability to use a limb. Besides the arm proper, there is a nervous mechanism regulating the movements of the arm. Not all cases of disability of the arm are due to perturbations of its nervous mechanism: in some cases the disability results from a fracture of the humerus or a boil in the axilla. In these cases the disability occurs *in spite of* the integrity of the nervous mechanism. Similarly, I submit that while some cases of morbid somnolence may be due to faulty regulation exercised by a disordered sleep centre, there must be other cases resulting from a disordered cortex, the cortex being excessively 'inhibitable,' i.e. succumbing with undue ease to the spread of inhibition *in spite of* the integrity of the sleep centre.

In a given case of morbid somnolence, how may one determine whether there is excessive cortical inhibitability? In answer to this question I offer two propositions.

1. *When the patient's only complaint is morbid somnolence, there is, in the present state of our knowledge, no way to tell whether the seat of the trouble is the sleep centre or the cortex.* Conceivably the sleep centre may be at fault, permitting a healthy cortex to 'fall asleep' too easily; or the cortex may be at fault, being unduly inhibitable.

2. *When the symptoms include 'localized sleep' in any of its forms, it would seem obligatory to infer that one or more parts of the cortex are unduly inhibitable.* This proposition must be presented more fully.

In a recent paper [1] I pointed out that certain clinical phenomena may be regarded as special instances of a general phenomenon designated by Pavlov as 'localized sleep.' The following are the most important examples.

(*a*) *Sleep-paralysis.*—It is convenient to cite this first. Sleep-paralysis exists in two varieties: *predormitial paralysis*, in which the patient, while falling asleep, suddenly finds himself paralysed, remaining so until he lapses into slumber a few minutes later (unless, as sometimes happens, the paralysis is accompanied by anxiety and the return of full awakeness); and *post-dormitial paralysis*, in which the paralysis is on waking. In each variety the patient is conscious. It seems permissible to say that in sleep-paralysis the 'motility substrate' is, in comparison with the 'substrate of consciousness,'

* It may be objected that decorticate animals have regular cycles of sleeping and waking. This by no means proves that the cortex has nothing to do with sleep. Unquestionably, sleep involves probably every part of the brain, indeed probably every part of the body. But when one thinks of a person asleep, the picture that comes to one's mind is of a person who makes few or no movements, who is unaware of the environment and whose thinking, if any, is reduced to the most primitive terms—a picture, that is, of a person whose cortical function is in partial, if not complete, abeyance.

unduly inhibitable. Thus, in the postdormitial variety, when the substrate of consciousness is released from inhibition (the patient waking), the motility substrate continues for several minutes under the inhibitory spell. If the motility substrate were not unduly inhibitable, it would be released from inhibition precisely at the same moment as the substrate of consciousness, and the patient would be able to move the moment he awoke.

Inhibition of the motility substrate may also occur without relation to falling asleep or waking, as in (*b*) and (*c*).

(*b*) *Cataplexy* : attacks of powerlessness, with unimpaired consciousness, precipitated by laughing and other emotions. Two facts are noteworthy. (1) The cataplectic attack is identical with an attack of sleep-paralysis (save in regard to the precipitating circumstances) ; in each the patient is conscious, powerless and atonic. (2) The cataplectic attack sometimes passes over into sleep, i.e. the inhibition presumed to exist in the motility substrate 'irradiates' to the substrate of consciousness.

(*c*) *Attacks of powerlessness, with unimpaired consciousness, occurring 'spontaneously,'* i.e. without antecedent emotion and without relation to falling asleep or waking.

The three examples just given have this in common, that the motility substrate is inhibited but not the substrate of consciousness. The reverse holds for the next example.

(*d*) *Increased Motor Activity during Sleep.*—Contrary to a belief once prevalent, many, if not most, narcoleptics are restless during nocturnal sleep. Moreover, when diurnal sleep supervenes during some motor performance, the patient sometimes continues while asleep to perform the movements automatically ; if, for example, he falls asleep while walking or riding a bicycle, he may wake up some distance away. Here one may assume inhibition localized in the substrate of consciousness. Answering to inhibition of this substrate, the patient is asleep ; answering to the absence of inhibition of the motility substrate, there are movements instead of muscular relaxation and inactivity.

The crux of this paper lies in my contention that (1) when clinically significant manifestations of localized sleep occur, it would seem obligatory to assume an abnormality of the cortex—an abnormality exhibiting itself in lack of uniformity in the degree of inhibitability of various parts of the cortex, some parts being more inhibitable than others ; (2) there is no such obligation when the patient has morbid somnolence but not localized sleep. When his only symptom is that he too often falls asleep, there is no way to tell whether his cortex is unduly inhibitable, or whether it is a normal cortex responding with morbid somnolence to abnormal conditions in the sleep centre. On the other hand, when a patient (with or without morbid somnolence) shows signs of localized sleep, one cannot escape the conclusion that some (if not all) of his cortex is unduly inhibitable. Taking a specific example, it is hard to imagine a perturbation of the sleep centre that could account for sleep-

paralysis. Assuming in the sleep centre a perturbation such as would produce a sleep attack lasting 10 minutes, the patient—if his cortex is normal—should respond with a sleep attack and nothing more; i.e. he should fall asleep in a normal way and, after 10 minutes, wake up in a normal way, without showing any phenomena that do not accompany the falling asleep and waking of a healthy person. If, instead of falling asleep normally, he first passes through a stage of paralysis, or if on waking there is paralysis, it would seem necessary to assume that his motility substrate is appreciably more inhibitable than his substrate of consciousness.

When, as I have already tried to show, a patient has morbid somnolence and not localized sleep, one cannot tell whether the sleep centre or the cortex is at fault. On the other hand, if it is correct to assume that localized sleep points to a disturbance of the cortex, one may, in a case of morbid somnolence *and* localized sleep, surmise that the somnolence is *probably* of cortical origin, in keeping with the principle that one disturbance if possible should be postulated to account for the symptoms of a given case.

The vast majority of patients with localized sleep also have morbid somnolence. For example, cases in which there is only cataplexy are rare, while cases of cataplexy and morbid somnolence are relatively common. In other words, cases are rare in which there is undue inhibitability of only one part of the cortex. Once a part of the cortex begins to show signs of undue inhibitability, other parts are apt to show the same quality.

Where, as regards localized sleep, shall one draw the line between normal and abnormal? This cannot be satisfactorily answered, and physicians must for the present rely on clinical common sense. When a patient complains that on hearty laughter he falls helpless to the ground, it is easy to recognize the symptom as abnormal. By contrast, I have seen a patient in whom strong emotion led to manifestations so nearly normal that it would be hard to say whether they are of clinical importance. The question is especially difficult in relation to restlessness and elaborate motor activity during sleep. Many narcoleptics fall asleep while walking and continue walking, but this happens also in the healthy; soldiers, for example, sleep on forced marches. Still more difficult is the question of the minor degrees of restlessness which occur during the sleep of the healthy as well as the narcoleptic.

CLASSIFICATION OF NARCOLEPSY AND ALLIED DISORDERS

In accordance with the foregoing discussion I suggest that cases of narcolepsy and allied disorders be divided into two groups.

Group One.—Cases of Morbid Somnolence, without Signs of Localized Sleep.—In these cases it is impossible, with present methods, to tell whether one is dealing with an unduly inhibitable cortex or with a normal cortex reacting to pathological influences extraneous to it.

Group Two.—Cases with Signs of Localized Sleep, with or without Morbid

Somnolence.—Here, as I have suggested, it would appear necessary to assume that part or all of the cortex is unduly inhibitable.

Occasionally there are cases of narcolepsy in which morbid somnolence appears first, cataplexy and other signs of localized sleep not appearing until much later. Such cases, prior to the onset of signs of localized sleep, would be regarded as belonging to Group One, whereas really they belong to Group Two. The fact that this error will occur in some cases does not render illogical the classification here proposed.

In Group Two, as in Group One, there are some cases that are 'idiopathic' and others that are symptomatic. The classification of ætiological factors proposed by Wilson [2] is valid for Group Two no less than for Group One. I believe that even in the 'idiopathic' cases there is some abnormality of the brain, even if this cannot be detected with present methods.

The proper use of the word 'narcolepsy' has occasioned much dispute. Many authors have felt that the term should not be restricted to cases in which morbid somnolence and cataplexy coexist, but should be applied also to those in which the only symptom is morbid somnolence. In view of the foregoing discussion I cannot agree with this opinion. It is misleading to attach much importance to the fact that the two groups of cases have a common denominator, morbid somnolence. No one would think of classifying under the same heading a case of chronic nephritis and a case of diabetes mellitus, notwithstanding their common denominator polyuria. The polyuria has different meanings in the two cases; in the one it occurs because of disease of the kidneys, while in the other it occurs *in spite of* the normality of the kidneys. Similarly, morbid somnolence may have different meanings in different cases. A case belonging to my Group One is potentially different from one belonging to Group Two, since in the one there is no certainty whether the cortex or the sleep centre is involved, while in the other it seems certain that the involvement is of the cortex. It matters not to which group one wishes to apply the term; I submit only that the term cannot logically do for both. My own inclination would be to speak of Group One as cases of morbid somnolence, and of Group Two as cases of narcolepsy. I would apply the term 'typical narcolepsy' to those in which there are both attacks of powerlessness (whether spontaneous or in relation to emotion or to falling asleep or waking) and sleep attacks. There are a few cases in which the patient has attacks of powerlessness but no sleep attacks; to these I would apply the term 'atypical' or 'abortive' or 'rudimentary' narcolepsy, specifying in each case the symptom or symptoms present—e.g. 'a case of cataplexy,' 'a case of sleep-paralysis,' or 'a case of cataplexy and sleep-paralysis,' etc.

The atonia that accompanies cataplexy has been mentioned only in passing, since this paper is concerned chiefly with the rôle of the cortex. Obviously, inhibition in the cortex alone will not account for atonia; one must assume that there is also inhibition of certain subcortical centres.

SUMMARY

Consideration is given to the rôle of the cerebral cortex in the pathogenesis of narcolepsy. The cortex is, so to speak, the part that sleeps. In Pavlov's terms, sleep is a state of inhibition irradiated over the cortex. The probable function of the sleep centre is to regulate the frequency, depth and duration of sleep ; but it is the cortex that ' sleeps ' and not the sleep centre.

Two groups of cases may be distinguished : Group One, consisting of cases of morbid somnolence, without signs of localized sleep ; and Group Two, cases with signs of localized sleep, with or without morbid somnolence. The four principal signs of localized sleep are cataplexy, sleep-paralysis, attacks of powerlessness occurring without relation to sleep or emotion, and increased motor activity during sleep.

In cases belonging to Group One it is impossible, with present methods, to determine whether the disturbance is in the cortex or the sleep centre. Conceivably in some cases the cortex is at fault, being unduly ' inhibitable ' (i.e. succumbing to inhibition with undue ease), while in others the cortex is normal but responds with morbid somnolence to some perturbation of the sleep centre.

In cases belonging to Group Two there are, on the other hand, reasonable grounds for the belief that it is the cortex which is at fault, parts or parts of it being unduly inhibitable.

REFERENCES

[1] LEVIN, M., ' The pathogenesis of narcolepsy, with a consideration of sleep-paralysis and localized sleep,' *Jour. Neurol. and Psychopath.*, 1933, **14**, 1.

[2] WILSON, S. A. K., *Modern Problems in Neurology*, 1929, chap. V (' The Narcolepsies ').

Editorial

BRAIN FEVER

POPULAR terminology does not often go far astray in respect of its application to disease-conditions with which the man in the street is more or less familiar. The old phrase 'falling sickness,' employed for epilepsy these thousand years and more, picks out the most prominent clinical feature, but its disadvantage is, patently, that in other morbid states than epilepsy the sufferer may fall down. 'Sleepy sickness' is accurate enough, yet not always appropriate, and apt to be confused with 'Sleeping sickness,' which is older and has the prerogative. Another type of age-old nomenclature is exemplified by such terms as St. Anthony's fire, St. Vitus's dance, St. Hubert's disease (who recalls to-day that rabies was once thus designated, after the patron saint of hunters?), which are now solely of historical interest. Still another form originates in some reputedly characteristic symptom, selecting it alone without the addition of 'disease,' 'sickness,' or other explanatory substantive. For example, 'the bends' has been the lay term for caisson disease—now, happily, virtually unknown; and we may allow 'the staggers' to pass muster in the same galley, although the word is not so specific as the other. To-day, again, a similar plural word (why invariably the plural is a matter provoking thought) is used with some inventiveness though also with inelegance for maladies of which the twentieth century is falsely imagined to have the preserve; across the Atlantic 'nerves' is being supplanted by 'the heebie-jeebies,' the 'jim-jams,' 'dithers,' and what not—neologisms of a sort, it is true, but not particularly illuminating or informative. 'D.T's.' has the merit of accurate abbreviation of a technical term; in fact, abridgements of such kinds are in common usage, as all know.

There is, however, a scientific expression which has never found its way into text-books yet was at one time, and that not so long ago, a favourite with the novelist—at least with a certain genus of that class. 'Brain fever' furnishes a fine example of a term that has been in vogue for a condition to

whose symptoms it is inapposite, while for those it might with some show of credibility be taken to illustrate it has never served. Whether the 'phrenitis' of the ancients meant anything specific, according to present-day conceptions, need not delay us; but 'brain fever' has, or had, a pseudo-specificity attached to it, although how this came about is certainly difficult to trace. 'Brain fever,' so far as we know, was never considered the equivalent of encephalitis, though it should have been; for fever is infection (in its widest sense), and infection of the brain is encephalitis. But the 'brain fever' of the yellowbacks belonged to another category; it was an ailment confined, largely if not entirely, to lovelorn, misunderstood, or jilted heroines; sudden in onset, as a sequel generally to an emotional episode, its initial symptoms comprised flushing, trembling, quivering in every limb, followed by passionate utterance of the heroine's woes in burning words —sometimes, indeed, at remarkable length, which might have been thought incompatible with fever; the flood of oratory, in its turn, was checked by sobs, choking in the throat, and blinding tears—alternatively, she would stare in front of her with 'bright, unseeing eyes,' and then sink gracefully to the floor, bereft of her senses. Within twenty-four hours her state would be one of raging fever, with hypomanic delirium, during which she tossed in her bed, oblivious to all stimuli; or, perhaps, one of cold, clammy, deathlike collapse, her lips murmuring the beloved name and alone indicating that life was not yet extinct. In point of literary fact, however, prognosis was invariably good, despite appearances, since after a week or a fortnight, being nursed by a single faithful (amateur) nurse night and day with unremitting care—itself quite a tour de force—the heroine recovered, though relapses were not unknown. The pathological anatomy of brain fever is therefore obscure, since no autopsy records can be unearthed.

To judge by its clinical manifestations, this brain fever showed an elective affinity for the basal ganglia and in particular for thalamus and parathalamic mechanisms; a 'thalamitis,' it was not, we suppose, of infective ætiology. More probably its basis was angiospastic, the phenomena being reversible and the duration brief. From the thalamus the cortex was flooded with inhibition. Do not let us delude ourselves into dismissing the syndrome as a figment of the melodramatic novelist's mind; on the contrary, it must have had its origin in what had been presented to the observer's eye. Was not Catherine Gordon of Gight afflicted with brain

fever when she cried 'My Byron! My Byron!' and swooned into insensibility what time Mrs. Siddons was sweeping members of her audience off their seats by her impassioned acting? Our diagnosis to-day is doubtless hysteria, and this provokes the interesting question whether hysteria is ever accompanied by rise of temperature and by fever. Medical literature of but three or four decades ago contains not a few references to hysterical fever, not all of which, on perusal, can be attributed to occult infection. It also raises the matter of hysterical 'insanity,' ignored to-day because the younger generation has never seen what hysteria can do when it is put on its mettle. Yet authentic cases are known in which episodes heavily charged with affect have precipitated in the hysterical subject a syndrome of 'brain fever' during whose course delirium was coupled with universal anæsthesia, with blindness, deafness, and closure of all centripetal avenues, and when apomorphine alone, by its profound visceral disturbances, seemed to be capable of breaking through blocked synapses.

Brain fever, at all events, is, or was, something surrounded with less ambiguities than the encephalitis of the day. For ten years and more neurology has been content (in fairness, be it said—not always, nor on the part of all) to regard epidemic encephalitis as an entity, a disease per se, despite the obscurity of its origins and mystery of its cause. Yet if recent studies by Levaditi and his colleagues carry weight epidemic encephalitis must fall from its high estate and become almost as nebulous as acute disseminated encephalomyelitis—possibly the best example of a pure medical abstraction, honoured with a long name, for which corresponding reality is still to seek. Experiences in Japan and St. Louis seem to show that epidemic encephalitis is not a unity, and that its syndromes and epidemiological features can be duplicated by disease-states owning another virus for their causation than that of Economo's 'lethargic' encephalitis. On sound nosological canons a *disease* must have one and always the same ætiology, manifest symptoms which though wide-ranging are always compatible, and react to the same specific treatment. Until the horde of virus variants are pinned down, isolated, cultivated, and ticketed, and their individual characters recognised, encephalitis will cover a multitude of morbid affections and continue to be as unspecific in the realm of pathology as cough or headache is in the clinical.

Abstracts

Neurology

NEUROANATOMY AND NEUROPHYSIOLOGY

[64] **Rigidity following ablation of the motor cortex in monkeys.**—J. C. McKinley and N. J. Berkwitz. *Jour. Nerv. Ment. Dis.*, 1933, **78**, 604.

Decorticate experiments on macacus rhesus monkeys gave the following results.

1. Bilateral decortication produced marked flexor rigidity in the neck, trunk, and upper extremities as the animals recovered from the anæsthesia. The lower extremities were usually less rigid and at times they were in extensor rigidity. As in decerebrate preparations these decorticated animals were unable to perform any voluntary movements, and tonic neck and labyrinthine reflexes were elicited. Temperature control, however, was maintained. No decrease in rigidity or return in function was noted in the chronic preparations.

2. Unilateral decortication produced spastic paralysis in the contralateral extremities as in human beings. A slight recovery of function and a decrease in rigidity were noted within two weeks following the operation, due in part to bilateral cortical representation, since, as noted, no appreciable recovery appears in the bilaterally decorticated animals.

3. Ablation of the major portion of the cortex posterior to the electrically irritable motor area resulted in asynergia and blindness, but not in any change in muscle tonus.

4. On removal of the cortex anterior to the electrically irritable motor area, no change in muscle tonus, but blindness, asynergia, and increased restlessness were observed.

5. On removal of the cerebral cortex, exclusive of the electrically irritable motor area, no change in muscle tonus, but blindness, asynergia, and increased restlessness were observed.

6. On removal of the electrically irritable motor cortex, marked flexor rigidity in the neck, trunk, and extremities developed immediately following operation. The rigidity in this case was not so marked as in the completely decorticated animals. This can be explained by the fact that some motor cortex may have been left intact in efforts to avoid injury to the adjacent areas.

7. On decerebrating decorticated preparations there developed a noticeable increase in the rigidity already present. This increase in rigidity

is ascribed to removal of propioceptive reflex pathways and basal ganglia, which doubtless also influence tonus.

8. Rigidity in decorticated monkeys is greater than in decorticated cats and dogs.

From these results certain deductions seem permissible, as follows :

1. The electrically excitable (motor) cortex of macacus rhesus monkeys exerts an important influence on muscle tonus. Conversely, those portions of the cortex which produce no motor response on direct electrical stimulation appear to exert no marked influence on muscle tonus.

2. The rigidity of decortication in monkeys is similar to, but not identical with, decerebrate rigidity, differing only in that it is of lesser degree.

3. The foregoing statements confirm a widespread clinical belief regarding the rôle of the motor cortex in the production of muscular rigidity.

R. G. G.

[65] **The conduction of labyrinthine impulses to the cortex.**—L. Aronson *Jour. Nerv. Ment. Dis.*, 1933, **78,** 250.

It is well known that artificial stimulation or disease of the labyrinth leads to giddiness. In other words, phenomena of consciousness are liberated through stimulation of the labyrinth. This means that there must be direct connexion between labyrinth and cortex. Experiments described in this paper indicate that the observation of Spiegel is confirmed that after strychninization of the gyri ecto- and suprasylvius posterior in cats and dogs, stimulation of the labyrinth can produce epileptiform convulsions.

Experiments were performed in which one labyrinth was destroyed and the above-mentioned cortical areas were strychninized on the same and then on the opposite side. In these experiments rotation still produced epileptiform convulsions.

These experiments led to the conclusion that each labyrinth is connected with the crossed as well as the homolateral cortex.

After total severance of the posterior longitudinal fasciculus rotation still caused epileptiform convulsions when the gyri supra- and ectosylvius were strychninized. The conclusion is that labyrinthine impulses reach cortical centres not only by way of the posterior longitudinal bundle, but also by other tracts outside of these pathways.

R. G. G.

[66] **Comparative accuracy in the localization of cutaneous pressure and pain.**—Michael J. Zigler, Eleanor M. Moore, and Mary T. Wilson. *Amer. Jour. Psychol.*, 1934, **46,** 47.

The experimental results presented here indicate that stimulations of pain are localized with a slightly greater degree of accuracy than stimulations of

pressure. Stimulations of pressure-pain complex are localized, in general, with a degree of accuracy slightly greater than that for either of the simple qualities of pain or pressure. The number of perfect localizations is slightly greater for pain and pressure-pain complex than for pressure, and largest errors of localizations tend to be greater in the cases of pressure and pain than in that of pressure-pain complex.

With regard to theory, the suggestion is made that the greater degree of accuracy of localization in the case of pressure-pain complex may find its explanation in the fact that two kinds of impulses are here being integrated in the cortex, whereas in the case of pain or pressure the impulses which arise from stimulation are more homogeneous in character. Although a body of relatively homogeneous impulses pass over the nerve in stimulations of simple pain and simple pressure, it is still possible that there is greater variability in the volley of impulses for pain than for pressure to account for the greater accuracy of localization in stimulations of pain.

C. S. R.

NEUROPATHOLOGY

[67] **Cerebellar hæmangioblastoma** (Emangioblastoma cerebellare).—P. E. Maspes. *Riv. pat. nerv. ment.*, 1934, **43**, 1013.

A case is described in which the author has demonstrated the histogenesis of the immature blood cells in the neoplastic parenchyma, with focal hæmatopoiesis. Various derivatives of the embryonic mesenchyma are shown whose presence would seem to establish for certain the hypothesis that these complex tumours are derived from mesenchymal foci which have wandered at a time when this tissue still has a considerable degree of pluripotentiality. The author further discusses certain general questions related to the diagnosis of vascular tumours of the brain and their clinical manifestations.

R. G. G.

[68] **Tumours involving the Gasserian ganglion.**—I. Cohen. *Jour. Nerv. Ment. Dis.*, 1933, **78**, 492.

The successful removal of a primary tumour of the Gasserian ganglion is reported and the rarity and interest of these tumours discussed. A useful table of Gasserian tumours described in the literature is given.

R. G. G.

[69] **On the structure and histogenesis of cerebral gumma** (Sulla struttura ed istogenesi della gomma cerebrale).—G. Zanetti. *Riv. pat. nerv. ment.*, 1933, **42**, 751.

A long and elaborate study of the brain in 14 cases of gumma with a bibliography of 736 references. Such a study cannot well be abstracted. It

would appear that in the case of gumma vascular and neuroglial tissues are most affected, and the study of these throws considerable light on the phenomena of gliosis in general. Many of the reactions which are grouped under the general heading of tumour may, it appears, be differentiated by modern methods and some may prove to be granulomatous and essentially inflammatory in nature.

R. G. G.

[70] **Cholesterin content of the cerebrospinal fluid in brain tumour** (Ueber den Cholesterunghalt des Liquor cerebrospinalis bei Hirntumoren).—F. PLAUT. *Zeits. f. d. g. Neurol. u. Psychiat.*, 1934, **150**, 172.

IN cases of cerebral tumour the amount of cholesterin is usually increased as compared with the normal. Such increase may be found in all cases of meningioma and neurinoma of the auditory nerve, also cases such as intracerebral tumour involving the ventricular walls. The cholesterin content is in close proportion to the amount of albumin, but not to the number of cells. In several other diseases of the nervous system no increase in cholesterin is found, a point which may be of assistance in the differential diagnosis from cerebral tumour. Normally in the ventricular fluid, in contrast with that of the subarachnoid space, the amount of cholesterin is too small to demonstrate by the methods available for clinical use. A measurable proportion suggests an increase. This was demonstrated in several cases of brain tumour. In cases of spinal block the amount was increased in the spinal fluid removed from the lumbar region, but it was normal in the fluid obtained by cistern puncture.

M.

[71] **Histologic changes in the brain in cases of fatal injury to the head.**—C. W. RAND and C. B. COURVILLE. *Arch. Neurol. and Psychiat.*, 1934, **21**, 527.

THIS contribution is based on the study of changes in the nerve-fibres resulting from the common and characteristic lesions consequent on injury to the brain. Particular attention has been paid to the changes in the axis-cylinders as demonstrated by specific impregnation methods.

Interruption of nerve-fibres with consequent impairment of nervous function is a common result of the various lesions of the brain consequent on injury to the head. This interruption results in the formation of end-bulbs on both the proximal and the distal segment, regardless of the point of interruption. Although short-lived, those found on the proximal end of the distal segment, more intensely impregnated with silver and simpler in structure, are capable of maintaining their identity for months or years.

These end-bulbs appear on fine fibrils within two hours and shortly thereafter on the medium-sized and large fibres. They are at the height of their development in four days. Those on the proximal end of the distal segment begin to be detached within two days and ultimately disappear. The distal segment undergoes granular, fragmentary or vacuolar degeneration, ultimately leading to disappearance of the axis-cylinder. The myelin sheath also undergoes degeneration. A peculiar combination of fragmentary and preservation necrosis was observed in local injuries associated with hæmorrhagic extravasations.

R. M. S.

[72] **The cerebral circulation : Cerebral anæmia. A discussion of the mechanism and a case report.**—Stanley Cobb. *Amer. Jour. Psychiat.*, 1934, **13**, 947.

It has long been held that the cerebral arteries do not anastamose, and it has also been held that these arteries have no vasomotor mechanism. Recent investigations have shown that both these ideas must be revised. A case is reported of a patient suffering from local convulsions of the right side, typically Jacksonian in character, which resulted in status epilepticus and death. Autopsy showed no softening or any gross lesion of the brain, but the cerebral cortex of the left motor area showed slight pallor. Histologically the nerve-cells in this region showed early anæmic necrosis. The pathology is discussed, and it is argued that partial anæmia is more likely to cause fits than complete anæmia, and also that a small focal area of such anæmia is more likely to produce status epilepticus than a large area.

C. S. R.

[73] **A study of the total protein of the cerebrospinal fluid in uncomplicated and untreated neurosyphilis.**—Purcell G. Schube. *Amer. Jour. Psychiat.*, 1934, **13**, 1085.

In all, 446 cases were studied : 357 of general paresis, 48 cases of tabes without psychosis and 44 cases of cerebrospinal syphilis with psychosis. The average value for cerebrospinal fluid total protein measured in mg. per 100 c.c. of cerebrospinal fluid was 75·4 for all cases of neurosyphilis, 79·0 in general paresis, 57·9 in tabes without psychosis, and 65·68 in cerebrospinal syphilis with psychosis. The middle 50 per cent. of the cases had a cerebrospinal fluid total protein falling between 41·01 and 109·79 mg. for all cases of neurosyphilis, between 43·70 and 114·30 mg. in general paresis, 37·06 and 78·74 in tabes without psychosis, and 31·96 and 99·40 mg. in cerebrospinal syphilis with psychosis. There is no true difference between any of the means excepting neurosyphilis and tabes without psychosis, and general paresis and tabes without psychosis. In these two instances the difference is so pro-

nounced that there is no question concerning its existence. If 39·99 mg. per 100 c.c. of cerebrospinal fluid is accepted as the upper limit of normal protein, it was found that 23·09 per cent. of all the cases of neurosyphilis possessed normal values; 20·72 per cent. of the cases of general paresis, 29·16 per cent. of the cases of tabes without psychosis, and 34·09 per cent. of the cases of cerebrospinal syphilis with psychosis also possessed normal values.

C. S. R.

[74] **Chemical changes in the blood induced by hyperpyrexial baths.**—H. Hopkins. *Arch. Neurol. and Psychiat.*, 1934, **31,** 597.

The purpose of the present study was to determine the chemical response of the body to hyperpyrexial baths, keeping in mind those changes favouring neuromuscular hyperirritability, such as alkalosis, disturbed water balance, hypoglycæmia and low calcium and high phosphorus levels, because of their bearing on the functional activity of the nervous system. Twelve young adult subjects were chosen because of the minor character of their complaints and the absence of organic disease, thus ensuring a relatively normal state of blood chemistry.

Specimens of blood were taken just before the bath while the patient was still in bed and again at the height of the febrile reaction in the bath. The body temperature was increased as rapidly as possible to between 105° and 106° F. within from 30 to 45 minutes. The maximum physiological and chemical responses were observed at the peak of body temperature; consequently this period was selected for investigation and comparison with the normal state of blood chemistry before the bath. The blood was analysed for *p*H carbon dioxide-combining power, hæmoglobin concentration, serum protein (albumin and globulin fractions), whole blood sugar, serum sodium, serum inorganic phosphorus and serum calcium (total and diffusible fractions).

The major changes observed in the body were alkalosis, water shifting, hypoglycæmia, rising inorganic blood phosphorus and falling blood calcium. These changes have the general combined effect of exciting nerve tissue and have definite influence on the appearance of the nervous and mental phenomena observed.

R. M. S.

[75] **Bromide intoxication: Its relation to the content of bromide in blood and the barrier permeability to bromide.**—S. Katzenelbogen, H. Goldsmith and Paul L. White. *Amer. Jour. Psychiat.*, 1933, **13,** 637.

In the diagnosis of bromide intoxication, the determination of bromide in blood may reveal the most significant, if not the only, pathognomonic symp-

tom. From observations of lack of correlation between toxic symptoms and bromide content in blood the inference is drawn that in following patients under bromide treatment it is the clinical features, and not the laboratory findings, that one should primarily reckon with in regard to the menace of bromide intoxication. However, when the blood bromide reaches a concentration neighbouring on 250 mg. per cent. the patient should be closely observed, for in most of those in whom abnormal findings could be elicited on clinical examination, the blood bromide was found to be near and above this level. The determination of the bromide permeability quotient cannot be used as a test of tolerance to bromide. The results obtained by these investigators do not corroborate the contention that substances introduced into the general circulation should first penetrate into the cerebrospinal fluid in order to affect the cerebrospinal nervous system.

C. S. R.

SENSORIMOTOR NEUROLOGY

[76] **Deficiency syndrome of the frontopontine cerebellar tracts** (Ausfalls-Syndrom der frontalen Brücken-Kleinhirnbahnen—Tractus fronto-ponto-cerebellaris).—H. Zingerle. *Zeits. f. d. g. Neurol u. Psychiat.*, 1934, **151,** 737.

In four cases the following syndrome developed either suddenly or gradually : severe disturbance of so-called ' principal ' movements, while orientation and expression movements were preserved. The maintenance of balance was impaired and there were disturbances of tone and posture.

This syndrome may develop on one side only or on both sides as the result of damage to the corticofugal frontopontine cerebellar tracts, either in the frontal region or below this level.

M.

[77] **Cysticercus isolated from a lateral cerebral ventricle** (Cisticerco isolato di un ventricolo cerebrale laterale).—G. Patrassi. *Riv. pat. nerv. ment.*, 1934, **43,** 543.

A woman of 33 years who in the preceding years had complained of intermittent headaches, in the week before her death presented other signs of intracranial tension, viz. vomiting, headache, giddiness, hyperæmia of the papillary veins, etc. At the same time there were signs of meningeal reaction both clinically and in the spinal fluid. The course was apyretic throughout. Death occurred suddenly with signs of respiratory paralysis. At autopsy a cysticercus was recovered from the right lateral ventricle. It was in a state of advanced necrosis and was engulfed in granulomatous tissue rich in eosinophils and directly surrounded by a halo of giant cells. Many cases

have been described in which cysticercus was found in the fourth ventricle, but only about a dozen in the lateral ventricle. This gives rise to the question of how it gets there, whether through the folds of the leptomeninges or against the current of the fluid. The author thinks that the terminal symptoms were produced by a liberation of toxins when the cysticercus was being disintegrated by the granulomatous tissue.

R. G. G.

[78] **Intracranial hæmorrhage in purpura hæmorrhagica.**—B. J. Alpers and W. Duane. *Jour. Nerv. Ment. Dis.*, 1933, **78**, 260.

A review is given of cases recorded in the literature and two cases are described. The diagnosis is not difficult, particularly where there is a history of preceding attacks of hæmorrhage from the mucous membranes and of petechial hæmorrhages in the skin. If grafted on these are unconsciousness, hemiplegia, signs of meningeal irritation or other localizing cerebral signs, one may make a diagnosis of intracranial hæmorrhage with a reasonable degree of certainty. Choked disk of considerable degree may be met with in these cases, but this condition tends to recede after a few weeks.

R. G. G.

[79] **On gliomata of the septum lucidum** (Sui gliomi del setto pellucido).—S. Marras. *Riv. pat. nerv. ment.*, 1933, **42**, 265.

Such tumours are very rare. A case is here described both from clinical and pathological points of view. There follows a long and erudite discussion of all the relationships of the particular lesion which is not capable of useful abstraction. In this case there was no corpus callosum lesion, but symptoms were referable to pressure on the cerebellum.

R. G. G.

[80] **A clinical and histopathological study of a case of amyotrophic lateral sclerosis of very long duration** (Studio clinico ed istopatologico di un caso di sclerosi laterale amiotrofica di lunghissima durata).—G. de Nigris. *Riv. pat. nerv. ment.*, 1933, **42**, 157.

The lesions met with were of a fragmentary character and distributed throughout the spinal cord from the bulb to the lumbar medulla with varying extension and intensity according to the segment concerned. The degenerative process was maximal in the uncrossed pyramidal tracts and in the motor and sympathetic cells of the medulla, but also extended through the greater part of the extrapyramidal tracts of endogenous spinal fibres and of the

posterior columns. It is specially noteworthy that a hypofunction and sclerosis of a great part of the endocrine gland system were found. This was secondary, according to the author, to the lesions of the sympathetic centres in the medulla.

It is also suggested that the disease is not a primary affection of the central nervous system, but a primary degeneration probably due to a toxin which reaches the cerebrospinal axis by way of vessels and neuroglia. This toxin, although it has a selective action on the pyramidal motor system, tends progressively to invade the whole nervous system in time.

R. G. G.

[81] **An infantile familial form of Schilder's disease** (Varieta infanto-familiale della malattia di Schilder).—P. Ottonello. *Riv. pat. nerv. ment.*, 1933, **42**, 416.

Three sisters in early infancy fell ill with a malady of slow progression characterized by a scattered syndrome similar to that of multiple sclerosis. This has generally been described as an infantile form of the latter. However, the three cases described show characteristics which place them in the category of Schilder's disease.

R. G. G.

[82] **A note on the palmar chin reflex of Marinesco.**—F. Golla and S. Antonovitch. *Jour. of Ment. Sci.*, 1934, **80**, 513.

Some brief account here given of the reflex as studied in the normal human subject. Single and successive electric stimuli were used and the nature of the response analysed. The reflex is homolateral and manifests itself as a phasic contraction lasting 100 σ. The latent period of the response showed a uniform value of about 50 σ, with a central delay of about 25 σ. There was an absolute refractory period of 0·7 σ to a second stimulus, and this was followed by a relative refractory period of 4·3 σ. Summation reached its maximum with a stimulus interval of between 4·3 and 5 σ. The response then diminished, at first rapidly and then slowly, until the stimulus interval very nearly equalled the length of discharge. The reflex was not inhibited by simultaneous stimulation of the opposite hand.

C. S. R.

[83] **Photographic study of ocular movements in mental disease.**—F. H. Couch and J. C. Fox. *Arch. Neurol. and Psychiat.*, 1934, **31**, 556.

Photographic recording of the ocular movements affords an objective approach to the study of patients suffering from mental disease. The authors

used the Dodge mirror recorder, which photographs horizontal deviations of the eyes. Four optical situations were explored : (1) Pursuit of a moving pendulum ; (2) optokinetic nystagmus ; (3) response to commands to look to right and to left ; and (4) response to peripheral retinal stimuli. The clinical material was composed of 117 cases, the conditions represented including psychoneuroses, different types of dementia præcox, manic-depressive psychoses, dementia paralytica, mental deficiency and a miscellaneous group of psychoses.

In 16 patients the ocular movements were found to be normal in every respect. In 60 patients the ocular response was normal except for disorders of attention. Evidence of defect or of inadequate adjustment appeared in the records of the remaining 41 patients. In over half of these a step-like interruption of the pursuit movement was present. This phenomenon, described by Diefendorf and Dodge in 1908 and believed by them to be characteristic of dementia præcox, was not confined to this disease group in the present series. Gross defects were present in 18 patients. They involved the response to one or more of the optical situations. They point to the presence of a profound incapacity for ocular adjustment, well beyond the domain of inattention. Both types of movements—pursuit and saccadic—were defective, regardless of the character of the stimulus. In general the 18 patients in this group were the most ill of all the series.

A striking feature of the records was the variability of response. This applied not only to patients in the same diagnostic group but to individual patients under different experimental conditions. A normal response was occasionally obtained from a very sick patient. Negativism was clearly demonstrated in the records of three of the patients in catatonic stupor. While watching the swinging pendulum the eye moved in a direction opposite to that of the pendulum. This was accomplished either by a quick jerk or by a slow drift in the reverse direction. In addition, gross defects in the various movements observed during the stuporous state disappeared from records taken following recovery. Such data indicate that disorders in ocular adaptation represent, in part at least, the general behaviour of the person.

R. M. S.

[84] **Studies of catatonia : Bodily postures assumed while sleeping.**—P. H. Du Bois and T. W. Forbes, *Psychiatric Quarterly*, 1934, **8**, 546.

A TWO-DIMENSIONAL sleep posture scale was devised by means of which photographs of the postures of sleeping subjects might be rated for curvature of the body and degree of rotation of the body. This scale was applied to the postures of 10 catatonic patients during a total of 39 nights. Evidence of preferential nocturnal postures was found. ' Curl ' or fœtal postures constituted less than 10 per cent. of the number of postures assumed. Less

than 7 per cent. of sleeping time was so spent. Comparison with one normal subject showed no significant difference. There was, therefore, no evidence supporting Kempf's theory of regression so far as this type of posture was concerned. Two patients who maintained extreme curl or ' fœtal ' positions during the day were found to assume a normal range of positions during sleep.

C. S. R.

[85] **Studies of catatonia : Central control of flexibilitas cerea.**—T. W. Forbes. *Psychiatric Quarterly*, 1934, **8**, 538.

Observational and photographically recorded data showed that flexibilitas cerea, which was present in two stuporose dementia præcox patients, disappeared with the onset of sleep. The motility of these two which was very low during the waking state became much greater during sleep, approaching, though not reaching, the range to be expected from normal sleepers. Three others who exhibited the waxy state during waking hours showed similar relaxation during sleep. Eight non-cataleptic dementia præcox patients showed no marked change between the waking and sleep state in similar records of motility. Their sleeping motility was quite comparable to that of the healthy normal individual. The author's results indicate that studies of experimental catalepsy which attempt to explain the waxy state in dementia præcox must provide a ' functional ' mechanism so that the quick reversibility at the onset or end of sleep is accounted for. On the basis of present knowledge, it seems safe to say that activity of either cortical or lower brain centres must be directly or indirectly responsible for the occurrence of flexibilitas cerea in stuporous catatonic dementia præcox patients. Future studies of experimental catalepsy in animals might well include a determination of the effect on the catalepsy of the stimulation of the sleep centres. If the elimination of the catalepsy by such stimulation occurred, it would be a criterion for the identification of experimentally produced catalepsy with that occurring in stuporous dementia præcox patients.

C. S. R.

PROGNOSIS AND TREATMENT

[86] **The atropine treatment of the postencephalitic Parkinsonian syndrome.**—Felix Adams and Powell L. Hays. *Amer. Jour. Psychiat.*, 1934, **91**, 151.

With 70 patients the authors obtained the following results : rigidity was practically removed in 35 per cent. of cases and greatly improved in 50 per cent. ; tremor was practically abolished in 50 per cent. and greatly improved in 35 per cent. ; gait and speech disturbance were remarkably improved in 95 per cent. ; oculogyric spasms controlled in nearly all cases ; improvement recorded in the physical condition of 90 per cent. of the patients. Using a

0·5 of 1 per cent. solution, the treatment began with 1 minim of the solution thrice daily until the fourth day, continuing the 4-minim doses for three days and again increasing until the tenth day when 8-minim doses are given for three days. On the thirteenth day the dose is continued at the rate of increase of 1 minim a day until the optimal dose is established ; this is usually between 12 and 18 minims thrice daily. Each case must be studied to determine the correct dosage—the quantity which just suffices to produce and maintain physical and psychic euphoria. One first determines the dose which no longer produces a noticeable improvement, then decreases the dose by 1 minim each day until the Parkinsonian symptoms become more pronounced. The optimal dose is usually midway between these two points. The atropine effect is more noticeable during the first ten days. After the optimal dose is established the patient may be fitted with special glasses to overcome the marked dilation of the pupils and be able to take the atropine indefinitely without bad results.

C. S. R.

[87] **The barbiturates in epilepsy.**—Richard Handley. *Jour. of Ment. Sci.*, 1934, **80**, 526.

This is a study of a large number of cases for long periods at the David Lewis Colony. It is shown how an epileptic may receive temporary benefit from any new form of treatment. When this ceases, an impression is obtained that tolerance is established, but this is not true tolerance. The real explanation of this temporary improvement is found in the mental attitude of the patient himself, who responds, but only for a time, to any form of treatment. After an exhaustive test it was shown that phenobarbitonum solubile (B.P.) is the best drug for general use in an institution. Prominal is indicated in the treatment of those who are anxious to keep at work and can afford this expensive drug. Phenobarbitone greatly reduces the incidence of ' jumps,' serial epilepsy, prolonged clonic convulsions and status epilepticus ; but with the exception of the first, once these conditions have begun they are not benefited by the drug unless it is given in large soporific doses. Warning is given of prolonged medication. No sign of mental deterioration is produced ; many cases are much improved. Although it has been the custom to withdraw the drug gradually, it was found that sudden complete withdrawal had no unpleasant results. Though an idiosyncrasy may occur, no craving is established. Emphasis is laid on the importance of suitable environment if epilepsy is to be treated successfully. The possibility of danger in phenobarbitone treatment has been grossly exaggerated and the severity of toxic symptoms much magnified. The drug has undoubtedly diminished the incidence of serious sequelæ, and a patient becomes brighter and more equable when under its influence.

C. S. R.

[88] **Further results in the treatment of eclampsia with pernocton** (Weitere Erfahrungen in der Behandlung der Eklampsie mit Pernocton).—H. GOECKE. *Münch. Med. Woch.*, 1934, **81**, 402.

FURTHER good results in the treatment of eclampsia with pernocton are reported in 73 cases. Usually 6 c.cm. are given by intravenous injection at the beginning of labour and delivery is performed as quickly as possible.

M.

[89] **Observations on the use of pyrifer.**—J. ERSKINE HOWIE. *Jour. of Ment. Sci.*, 1934, **80**, 521.

VERY briefly the method of pyrifer administration and its reactions are given. In general paralysis with this form of treatment the results in 1933 were 15 cases, with six patients improved, or if the advanced cases were excluded, 10 cases with six improved. The total figures for malarial treatment during the same period were 13 cases with five improved. In schizophrenia 21 cases have finished the course of treatment; of these eight have shown some improvement.

It seems that pyrifer might be regarded as a valuable therapeutic preparation which, if the results are permanent, will compare favourably with malaria, or at any rate will provide a useful alternative. It would appear that pyrifer has certain advantages compared with malarial treatment as it avoids the introduction into the patient's system of a serious infectious malady which taxes his strength to the utmost. The height of the temperature can be readily controlled, and this makes it possible for the treatment to be applied to old and feeble patients. It is borne very well and is comparatively free from danger. There is no pain following the injection, and a further advantage is that it can be combined with specific antisyphilitic treatment introduced during the fever therapy. The time of the pyrexia can be arranged—a point of no little importance.

C. S. R.

Psychopathology

PSYCHOLOGY

[90] **Experimental study of moods.**—V. E. FISHER. *Character and Personality*, 1934, **2**, 201.

IN this study the writer has assumed that the hypnotic induction of a mood in a socalled normal subject does not in any vital respect vitiate the personality 'make-up' except to bring about artificially a certain feeling-emotion orientation, which might easily occur as the result of any one of a thousand things likely to happen in daily life. A study of the experimental results

reveals a fairly consistent difference in reaction time for the different moods, irrespective of the particular type of words considered. Thus the average reaction time in the despondent mood of all the subjects for the selected words was 167 per cent. of the reaction time in the normal mood. There was also noted an appreciable difference in reaction time, when the averages are considered, for the different types of words : words without strong mood associations gave the shortest reaction time, words with pleasant mood associations coming next, words with unpredictable mood associations third, and words with unpleasant mood associations giving the longest.

It may be held that a mood is a general response, ' postural ' or of the nature of a ' mental set,' and that it therefore acts as a selective factor which tends to inhibit or block all ideational responses except those belonging to a certain category ; and that this selective function tends to lengthen the reaction time. It may be argued, following Janet, that a mood is a matter of mental depression, a relative lack of psychic energy, and that due to this insufficiency of ' push,' intellective reactions tend to be retarded. Somewhat in line with Jung's psychology, we might reason that a mood, whatever else, is an ' introversion of the libido,' in other words, a tendency on the part of the individual to engage himself with the matter of how he feels, and that this self-preoccupation interferes with his responding to events in the external environment. Finally, it might be contended that a mood amounts to an accumulation of energy ready for discharge, that it is a preparedness for action, lacking, however, direction or orientation ; and that therefore every thought tends to be ' held up ' for examination, very much as when one is trying to decide among several different alternative modes of action.

C. S. R.

[91] **The measurement of handwriting considered as a form of expressive movement.**—O. L. HARVEY. *Character and Personality*, 1934, **2**, 310.

THIS study suggests two principal tentative conclusions. The first is that the personality characteristics graphically expressed in handwriting are the outcome of probably highly complex patterns of behaviour ; consequently any attempt to discover characteristics of ascendance or psychoneurosis in handwriting must necessarily consider not simply the significance of an individual sign here or there, but the complicated relationships between many signs. The second is that, although, when taken singly, handwriting measures bear little if any relationship to measures of psychoneurosis and ascendance, nevertheless, when combined in their optimum relationships, they yield surprisingly high indices, enabling one to predict a person's rating on either of these scales within a few points with considerable probability of success.

C. S. R.

[92] **A British pair of identical twins reared apart.**—Robert Saudek. *Character and Personality*, 1934, **3**, 17.

The various intelligence tests in the main are closely similar and the varied personality tests on the whole tally although there are certain discrepancies. In some respects in the personality tests the twins differ distinctly, particularly when the quality of their reactions is taken into consideration. One appeared to be more extraverted and sociable, somewhat better adjusted, somewhat self-assertive and rather independent. The other was decidedly less extraverted, and according to two tests even somewhat introverted and less well adjusted. The differences of the personalities appeared to be differences of degree rather than of kind. Graphology does not claim that it can improve upon the diagnosis of intelligence based on the standardized tests; but it is felt that the analysis of the handwriting has supplemented the findings of the emotional tests. A younger brother seems less similar to either twin than the twins to each other; but as he grows older he may become more similar to his twin brothers than his tests at the age of 16 and his writing at the age of 15 would indicate. On the whole the case suggests—as in fact did the majority of other cases of identical twins reared apart—that there is a greater similarity in intelligence than in emotional reactions.

C. S. R.

PSYCHOSES

[93] **A case of schizophrenia in one of identical twins.**—J. Kasanin. *Amer. Jour. Psychiat.*, 1934, **91**, 21.

In identical twins we have the opportunity of studying the specific influence of environmental factors. If schizophrenia is due to a fundamental defect in the germ-plasm, then no matter what the environment would be, if one identical twin develops schizophrenia the other is bound to develop the same disease. The reports thus far have tended to support this point. Here a case in which only one twin was affected by the disease and where the other has remained well for eight years is briefly discussed. An analysis of it shows the great importance of the environmental factors. The twin brothers, with approximately the same endowment and with similar life careers up to the age of 18, had then a sharp change of environment, favourable for one and unfavourable for the other. They then developed altogether different psychobiological reactions. The former became a well-adjusted man in his community; the latter did not succeed, projected his failure on the outside world, and became psychotic. Granting that there is some slight difference even in identical twins, a significant dynamic influence of environmental forces leading to the preservation of mental health in one twin and the formation of a psychosis in the other, seems thereby to have been demonstrated.

C. S. R.

[94] **Constitutional schizophrenia.**—KARL M. BOWMAN and JACOB KASANIN. *Amer. Jour. Psychiat.*, 1933, **13**, 645.

IN coding the definite ætiological factors in 151 cases of schizophrenia mental constitutional anomalies were found in 40·4 per cent. Such a figure does not, however, give any indication of its relative importance in any particular case. The incidence of the constitutional factor would obviously include all cases coded as positive for constitutional anomalies—physical, mental, and for heredity. It was thus found that 116 out of the 151 showed a constitutional factor to be present and to have helped to precipitate the psychosis. It was felt also that cases showing an insidious and indefinite type of onset were more likely to be on a constitutional basis that others. Out of the 151 cases 65 were found to have had this type of onset. When, however, cases were coded negative for environmental stress, physical disease, alcoholism, and reproductive conditions, twelve might be said to represent pure types of constitutional schizophrenia. In trying to develop their concept of constitutional schizophrenia, these observers felt that there was a group of cases which showed a marked similarity in all respects. There would be a definite family history of mental disease, especially schizophrenia; the individual from very early childhood would be regarded as queer and odd by his associates. He would seldom mix well with others. This personal oddity would increase with age and there would be an indefinite, insidious onset of the psychosis without any unusual environmental stress or without any physical disease. The psychosis would be mainly an exaggeration of the peculiar personality shown since childhood. Such cases are regarded as forming a distinct group.

C. S. R.

[95] **An examination of the clinicopathological evidence offered for the concept of dementia præcox as a specific disease-entity.**—JACOB H. CONN. *Amer. Jour. Psychiat.*, 1934, **13**, 1039.

THERE are many contradictory opinions expressed on the topic of a uniform anatomical basis to this disorder. There has been no satisfactory correlation made between the socalled classical groups of dementia præcox and specific anatomical findings. The same *histopathological* findings which are reported as being specific for these groups are also reported as being present in a variety of organic and toxic conditions. There is no uniformity to be found in the various *clinical* contributions as to what constitutes a dementia præcox reaction. The attempt to group these heterogeneous findings into a specific disease-entity comparable to that of general paralysis has proved to be progressively less productive of constructive formulations over a period of 50 years of intensive search.

C. S. R.

[96] **Studies of catatonia : Electrical skin resistance of catatonics during sleep.**—T. W. Forbes and Z. A. Piotrowski. *Psychiatric Quarterly*, 1934, **8**, 722.

This is a study of electric body resistance of 10 catatonic dementia præcox patients and four normal persons. No apparent relationship between the Richter type of resistance curves and sleep occurred in normal subjects. A drop in the resistance level of non-sudorific areas took place quite frequently with both groups and was probably related to the ' rest curve ' noted in the psychogalvanic studies. The catatonics showed a greater percentage of records in which variations of resistance of more than 20,000 ohms occurred. The number of irregularities in the curves was also slightly greater but less characteristic of the psychopaths than the amplitude of the fluctuations. It is tentatively suggested that a greater minute-to-minute instability or variability of autonomic function is indicated in the catatonics. It cannot be stated whether this variability is characteristic of the catatonic group or of psychotic patients in general, although the latter seems more probable. This variability probably should not be confused with psychogalvanic reactivity to an external stimulating situation.

C. S. R.

PSYCHOPATHOLOGY

[97] **Oral erotism in paraphrenia : Facts and theories.**—A. J. Westerman Holstijn. *Internat. Jour. of Psycho-Analysis*, 1934, **15**, 160.

In paraphrenics the mouth is in a state of peculiar excitation. Orality, pyknic traits and an element of mania occur regularly in this group. As in mania, the manic symptoms have their origin in an accentuated oral erotism, directed towards objects in the outside world. The pyknic mouth is a constitutional hereditary characteristic of the outward form, which points to a constitutional accentuation of the oral function. The delusions (like the manic symptoms) draw their sustenance from oral erotism. When homosexual libido, which has been detached from external objects, is regressively projected once more into the outside world, it may force its way out either through anus or mouth and give rise to the feeling of being persecuted. It then finds its goal in the processes of eating and being eaten, experienced by many paraphrenics in their delusion. The thought of persons of the manic type is primarily the outcome of their copious speaking, the libidinal hypercathexis of the mouth and organs of speech. But in schizophrenics the content of their thought is more important : the inner complex plays a greater part in it. Cathexis of the idea of words represents the schizophrenic's first attempt at recovery, but it is from these ideas of words that his delusional thoughts are formed. The unification of their mental processes is most readily accomplished by those patients who retain the strongest oral erotism but

who at the same time remain capable of sublimating it in the tendency to combine feelings, words and concepts, like one huge mouthful, in a systematized, homogeneous tissue of delusion.

C. S. R.

[98] **A psychoanalytic theory of hallucinations.**—Isador H. Coriat. *Psychoanalytic Review*, 1934, **21,** 372.

Hallucinations like the symptom formation of the conversion hysterias may be called materialization phenomena since their essence consists in the realization of a wish. The symptoms of conversion hysteria are repetitions of unconscious phantasies in bodily terms; hallucinations are repetitions of unconscious material in sensory terms. However, the mysterious transformation or conversion from mental to bodily or sensory, both in conversion hysteria and in hallucinations, remains a problem. If we assume that thinking is nothing but the equivalent of a hallucinatory wish, then what is characteristic for the dream-content may also enter into the mechanism of projected hallucinations, both being regressive processes. Unconscious wishes can be regarded as realities when they enter consciousness only if that part of the mental apparatus, the ego, has abandoned or inhibited its chief function of the testing of reality as it does in dreams or hallucinations. It is only under these circumstances of regression and loss of reality function that the memory traces appear real; consequently hallucinations bear the stamp of reality. The formation of wish phantasies and their regression to hallucinations, while the most essential aspects of the dream-wish, do not belong exclusively to dreams, but also enter into the mechanism of waking hallucinations. Because the dream-wish is converted into a hallucination, there is a belief in its reality, the same type of belief that takes place in the hallucinatory symptom of the psychoses.

C. S. R.

[99] **The nature of emotion and its relation to antisocial behaviour.**—Fred Brown. *Jour. Abnorm. Soc. Psychol.*, 1934, **28,** 446.

'Psychopathic personality' is not to be attributed to an organic or functional defect. Psychopathic behaviour or emotional maladjustment is strongly indicative of trial-and-error attempts to utilize the constantly accumulating energy generated in the presence of a stress-strain situation for which the individual possesses no adequate outlet. Consequently, otherwise normal reactions become overcharged with energy and result in antisocial modes of response or else less adequate responses are utilized to relieve the tension state. The fault lies in the *type of behaviour* utilized rather than in fundamental physio-organic disorder. Since all social behaviour is learned there is

hope for the ultimate elimination and prevention of antisocial modes of conduct now designated as ' emotional ' in nature.

C. S. R.

[100] **A study of forty cases exhibiting neologisms.**—E. L. Bryan. *Amer. Jour. Psychiat.*, 1933, **13,** 579.

After a survey of the literature on the subject the findings from a study of 40 cases evincing neologisms are given. The diagnoses were not all dementia præcox, although there were schizoid factors in every case. There was one general paretic (tabetic form), one manic-depressive, one psychosis with cerebral arteriosclerosis, and one alcoholic psychosis. Of the 36 cases of dementia præcox, 27 were paranoid, three simple, three hebephrenic, one catatonic, and two undifferentiated. Only two were described as below normal intelligence. This bears out the correlation of ability to evolve symbols with primordial potency, and shows that the ability is far more common among individuals of high intelligence and talents. One interesting fact observed was that as a group they were, in an unusually large proportion, grandiose. It was almost impossible to get sufficient contact with the patients to work out per se the mechanisms from their own productions. The common idea that all neologisms are associated with sexual complexes was not borne out by many words. This study revealed that the neologisms of the insane are originated and constructed in much the same way as those of the normal. It was noted that as in normal people the patients had had an experience for which their vocabulary was inadequate, a desire to communicate or to refer the experience either to real or imaginary persons ; sufficient ability to evolve the symbol ; and too little social intercourse to realize the unpopularity and frequent ambiguity of the chosen symbol. Probably the great difference in the neologisms of the insane lies in their significance as key-words to an uncommunicated mental content that with intensive study in each case might yield its hidden mechanisms.

C. S. R.

[101] **Mental aspects of brain tumours in psychotic patients.**—G. R. Jamieson and G. W. Henry. *Jour. Nerv. Ment. Dis.*, 1933, **78,** 333 and 500.

Twenty-six verified cases are surveyed.

In about one-third of the cases a well-developed psychosis had been recorded before there was any indication of brain tumour. In some cases the clinical manifestations of disease were modified by senility, arteriosclerosis, syphilis or alcoholism, but otherwise the sole factors were the type of personality, the previous psychosis and the brain tumour. Diagnosis is difficult ; cerebral tumour was not diagnosed in more than 30 per cent. of

cases before death. No psychosis peculiar to brain tumour can be described, but certain general features in the clinical picture of brain tumour of interest to psychiatrists may be remarked. It is noteworthy that every psychotic patient has his own individual peculiarities and that any complicating physical disease produces radical changes in the clinical picture. The patient begins to behave and talk in a more normal way, at least as long as the complicating disease forces itself upon his attention. He interrupts his psychotic behaviour and talk to make known that he is not feeling well, that he has a headache, that he suffers vertigo or that he is in some other way in distress. As a rule complaints are not associated with or supported by psychotic trends. In other words, there is a marked contrast between the new symptoms and those characteristic of the uncomplicated psychosis. In addition there may be radical changes in the behaviour or in the general condition of the patient, including the appearance of neurological changes. If the clinical picture of brain tumour superimposed upon a psychosis were to be described briefly, it might be said that it is characterized by changing contrasts and incongruities in the symptoms and signs and by evidence of organic disease of the brain, which becomes increasingly obvious.

Periods of blind, impulsive excitement, frenzy and violence with unaccountable irritability, may be followed by or alternate with periods of generalized retardation, mental dullness, somnolence or stupor. There often are lucid intervals or at least periods during which the patient returns to his former psychotic state. The somnolence may be dissipated by repeated questions or other stimuli, only to return when the patient is free to follow his own inclinations. Carelessness in personal appearance and incontinence make known increasing apathy.

The patient's talk is consistent with other forms of psychomotor activity. When aggressive and talkative he is more often unpleasant and abusive in language. At other times he may have great difficulty in elaborating and expressing his thoughts and he may even become mute. These wide variations in the degree of psychomotor activity may take place within a short period of time and are in striking contrast with the former clinical picture.

The mood of the patient is usually consistent with the seriousness of the illness or the degree of suffering. More than half of the patients are depressed and a larger percentage are distinctly apprehensive. Euphoria is uncommon and its presence is always in striking contrast to the actual situation. At least one-fourth of the patients were suicidal.

Disorientation or confusion was common, especially when the tumours involved the frontal, parietal or temporal lobes. It is rather characteristic that the amount of confusion fluctuates, apparently according to the degree of increased intracranial pressure.

Memory and retention disorders are most directly related to the amount of confusion present. As a general rule the more complex intellectual processes suffer first, and there are times when memory and retention are

almost completely lost. Recent memory is usually more seriously affected and not uncommonly fabrications can be elicited.

At least one-fourth of the patients had some insight into the fact that a serious complication had arisen in the illness or that mental functions had been altered. Their own spontaneous complaints should have aroused the curiosity of the physician and furnished valuable clues as to the nature of the complicating disease. Through a change in symptoms these patients gave from a few months' to several years' warning of the presence of organic brain disease, and when the peculiar variations in the clinical picture are considered it would seem that brain tumour should have been included among the possibilities.

The series of cases here presented is not sufficiently large to permit many general conclusions, but the findings are essentially in agreement with those of Baruk, who has made a similar study of 41 cases of brain tumour verified anatomically. It is probable that the extremely irritable, anxious, excitable and aggressive periods represent distress from localized pressure or the milder degrees of increased intracranial pressure, while the periods of retardation, somnolence, confusion and memory disorders represent a degree of increased intracranial pressure which seriously interferes with all conscious activities. When in distress from physical suffering the psychotic patient is no different from any other. He either prefers being left alone or he appeals for help. Whenever he indicates through his complaints or his behaviour that the distress is within his head, he speaks as loudly as he would if he were normal, and he should be heard, providing the physician is not distracted by the manifestations of the psychosis.

R. G. G.

[102] **A study of recidivists and first offenders of average and defective intelligence.**—Myra E. Shimberg and Judith Israelite. *Amer. Jour. Orthopsychiat.*, 1933, **3**, 175.

A follow-up study was made of 50 intellectually average and 50 defective recidivists, and of 26 average and 26 defective first offenders. Sixty-six per cent. of the intellectually average recidivists and 70 per cent. of the defective recidivists were failures as regards further acts of delinquency. Thirty-five per cent. of the intellectually average first offenders and 39 per cent. of the defective first offenders were also considered as failures. The authors conclude that there is practically no difference in adjustment between those of average and defective intelligence either as recidivists or first offenders. The prognosis for first offenders, however, seems to be twice as favourable as that for recidivists. They also subscribe to the conclusion that the early belief that feeble-mindedness was in general and by itself a very important cause of crime is not substantiated.

C. S. R.

[103] **A thousand cases of attempted suicide.**—FREDERICK C. LENDRUM. *Amer. Jour. Psychiat.*, 1933, **13**, 479.

THOUGH not entirely representative of the whole class of patients who attempt suicide, 1,000 cases admitted to hospital because of such an attempt are here analysed. The curve of distribution by age contained, among females, a conspicuous peak between the ages of 20 and 24, and very few cases after the menopause. Among males, the peak of the curve came between the ages of 25 and 29, and there was very little decline in the rate of suicide with advancing years. Members of the negro race made a relatively larger number of attempts and achieved a relatively smaller number of successes than members of the white race. Attempts were relatively rare in the early morning and most frequent in the evening. They were also relatively rare in the middle of the week and most frequent near the week-end, especially on Sunday and Monday. The leading motives assigned by the males were economic difficulties and by females marital, domestic, or amatory discord. Twenty-three per cent. of the patients received some psychiatric diagnosis, which in a little more than half of the cases was of some phase of acute or chronic alcoholism. Poisoning was the leading means employed by both sexes, although the relatively greater preference of males for mechanical methods largely accounted for the greater proportion of deaths among male patients. The almost wholly innocuous tincture of iodine was the most popular poison. It was followed in order of frequency by the much more dangerous solution of lysol, mercuric chloride, and phenol, respectively. On the basis of the present data, the prediction is made that only a small percentage of these patients will make another attempt.

C. S. R.

[104] **Some psychiatric aspects of suicide.**—GERALD R. JAMIESON and JAMES H. WALL. *Psychiatric Quarterly*, 1933, **7**, 211.

THE essential features in the 25 hospital cases here briefly reviewed were: (1) Severe hypochondriacal and nihilistic ideas, with veiled death wishes in the trend. (2) Insomnia; not the actual sleeplessness itself, but the apprehension and agony concerning its possible effects. (3) Persistent belief in losing control of oneself, of 'going insane,' and analogous ideas. (4) Sense of guilt with persistent belief and concern about punishment, especially by torture of one kind or another. (5) Evidence of aggressiveness as indicated by surly, impatient and irritable attitudes together with assaultive tendencies. As corollary signs there were noted sudden improvement in a depressed, hopeless, and perhaps delusional patient, and a history of previous half-hearted or serious attempts.

C. S. R.

[105] **Frequency of cancer in the insane.**—Shields Warren and Myrtelle M. Canavan. *New England Jour. Med.*, 1934, **210,** 739.

Few data are available relating to the subject though scattered studies have been made without any definite conclusions, and some of these are here briefly reviewed. The writers studied the proportion of cancer found among 2,627 autopsies. The cancer cases numbered 114, or 4·3 per cent. Practically all types of mental disorder were represented. The majority of the cases had been inmates for a considerable period of time. The difficulty of obtaining a satisfactory norm for the expected cancer incidence is great, and the danger of attempting to draw conclusions based on the use of proportionate mortality rates was duly appreciated. If the accuracy of available information is assumed, cancer is abnormally infrequent in the insane. This might be explained by environment, by heredity, or most likely by the relatively short life expectancy of the psychotic patient. We must at least consider the hypothesis that the soil best suited for the development of cancer differs from that in which insanity develops.

C. S. R.

PROGNOSIS AND TREATMENT

[106] **The diathermy treatment of dementia paralytica.**—W. Freeman, T. C. Fong, and S. J. Rosenberg. *Jour. Amer. Med. Assoc.*, 1933, **100,** 1749.

Treatment of 50 cases of general paralysis during a period of four years by the technique of diathermy has in the authors' hands produced very poor results. This is contrary to the experience of a number of other observers. During the application of the treatment considerable difficulties arose; the patients sometimes became very restless, and in two instances extensive second degree burns followed shifting of the electrodes. Convulsive seizures occasionally appeared, while marked prostration succeeded most of the treatments. No fewer than 28 patients died.

The authors give a description of the pathological findings of six cases treated by diathermy, which is a novel contribution to the subject. In each, persistent inflammation of the usual kind was seen.

J. V.

[107] **The malariotherapy of dementia præcox** (Contributo alla malarioterapia della demenza precoce).—P. Varenna. *Riv. sper. di fren.*, 1933, **57,** 1.

One hundred and seven cases of dementia præcox have been treated by malarial therapy. Of these, 32 showed some improvement during the course of the treatment, which ceased when the latter came to an end. Two were

considered to be much improved, and to continue so. In all the others the method was a failure.

J. S. P.

[108] **Psychotherapy in private practice.**—D. A. Thom. *Amer. Jour. Psychiat.*, 1933, **13**, 77.

Following a brief survey of psychotherapeutic methods in the past the writer concludes that there will be different approaches which can be utilized to advantage depending upon (1) the personality of the patient, (2) the nature of the symptoms, (3) conditions under which the symptoms were acquired, (4) the purpose they serve, (5) whether the precipitating cause continues to operate, (6) the method in which the therapist has the most confidence. There is a certain level of intelligence to which any type of analysis would probably not be applicable; other patients have an intelligence which would be offended by the cruder methods of suggestion. There are symptoms, the nature of which represents a real handicap to any other type of treatment than that of suggestion where the rational and practical approach would naturally be to clear up the symptoms and then determine and treat the cause. It is the author's feeling that those psychoneurotic conditions which have an abrupt onset are usually found in patients with a rather mediocre type of intelligence, where the outstanding symptoms, usually of a physical nature, representing a very immature way of meeting the particular life situation, can be most effectively helped by treating the symptoms by suggestion and the residual by analysis or re-education. The anxiety neuroses are invariably the result of psychic trauma which the patient experienced long before the onset of the incapacitating symptoms, and these symptoms continue after the precipitating factor has been removed. Therefore they are not amenable to the same therapeutic measures as are states of anxiety which bear, in a general way, a fairly definite relation to causal factors. 'What purpose does the neurosis serve in the life of the individual?' is a question which not only demands an answer but is helpful in the solution of the patient's problem. There is a direct relation between the ability of the psychiatrist to answer it correctly and the success of his therapy. If suggestive methods are utilized when the analytical approach would be the one of choice, it must be recognized that a substitute is being used and sometimes a poor one.

C. S. R.

[109] **Malarial therapy in non-syphilitic psychosis** (Malariaterapia delle psicosa non luetiche).—M. L. Bianchini and J. Nardi. *Arch. gen. di neurol. psichiat. e psicoanalis.*, 1932, **13**, 121.

The authors record the results of a survey during five years of 476 subjects, of whom 404 were completely analysed, belonging to 14 groups of various

psychoses. They describe the technique and the history of the method, and conclude that the mechanism of the therapy is the same in paresis and in non-syphilitic psychoses. This method gives positive results in about 25 per cent. of schizophrenics, 44 per cent. of manic-depressive cases, and about 10 per cent. of success in other forms of psychoses acute or chronic—infective, arteriosclerotic or endogenous. No results were obtained in epilepsy, post-encephalitis, stupor or amentia. Malaria therapy is indicated in general states of psychomotor excitement. It is always inoffensive, and often gives rise to definite improvement in the general metabolism of the patient. According to the authors, malaria treatment carried out by the methods described ought to become an integral part of psychiatric practice.

R. G. G.

[110] **Analysis of a case of migraine.**—E. GUTHEIL. *Psychoanalytic Review*, 1934, **21**, 272.

THE patient, a woman of 32, married and childless, had suffered from typical attacks of migraine every few days since the age of 16. The outstanding symptom of this case was the fact that the attack in most cases ended after a manifest sexual orgasm. Frigidity and a heart neurosis were the only neurotic symptoms worthy of note. It is claimed that the migraine represents an attempt of the patient to 'abreact,' in a form which she can accept consciously, phantasies, which must not reach consciousness. Each time when through processes of association forbidden thoughts come to life in her subconscious, the attack comes on. The headache is a somatic portrayal of her mental conflict and of the repression taking place, and at the same time a product of self-inflicted punishment. According to the writer's experience most cases of migraine show an orgasm in masked form, for the most part during the attack itself. Analytic treatment greatly benefited the patient.

C. S. R.

[111] **The nature of the therapeutic action of psychoanalysis.**—JAMES STRACHEY. *Internat. Jour. of Psycho-Analysis*, 1934, **15**, 127.

THE four main points of the hypothesis that the author here puts forward are :

1. The final result of psychoanalytic therapy is to enable the neurotic patient's whole mental organization, which is held in check at an infantile stage of development, to continue its progress towards a normal adult state.

2. The principal alteration consists in a qualitative modification of the patient's super-ego, from which the other alterations follow in the main automatically.

3. This modification of the patient's super-ego is brought about in a series of innumerable small steps by the agency of mutative interpretations, which are effected by the analyst in virtue of his position as object of the patient's id-impulses and as auxiliary super-ego.

4. The fact that the mutative interpretation is the ultimate operative factor in the therapeutic action of psychoanalysis does not imply the exclusion of many other procedures (such as suggestion, reassurance, abreaction, etc.) as elements in the treatment of any particular patient.

C. S. R.

Reviews and Notices of Books

A Textbook of Medical Psychology. By Ernst Kretschmer, Dr. Med., Professor of Neurology and Psychiatry in the University of Marburg. Translated with an introduction by E. B. Strauss, D.M.(Oxon.), Assistant Physician to the Cassel Hospital for Functional Nervous Disorders, etc. London: Oxford University Press; Humphrey Milford. 1934. Pp. 274. Price 15s. net.

Professor Kretschmer's name has become well known throughout the field of psychiatry for his work on personality types and temperaments; his textbook on medical psychology, which has passed through several editions in Germany, is here presented to the English reader in lucid, well-turned, English sentences. The subject-matter is perhaps somewhat unusual, in the sense that, as the translator remarks, it is less a system of psychiatry than a compendium of empirical facts and observations culled from various medical and non-medical sciencies, ranging from anatomy to æsthetics. Professor Kretschmer plunges in medias res at the outset by discussing the eternal problem of the relation of body to soul, claiming that the psyche is not exclusively bound up with the brain, but that endocrines, the autonomic nervous system, and indeed the body generally take also an integral share in the partnership. He rightly stresses the view that it is more helpful to examine what is common to psychical and neurological processes than to emphasize the differences. Much is made of the mnemonic associational functions attributed to the cerebral cortex, and the general import of agnosia and apraxia properly recognized. Discrete activities of the cortex are systematically coordinated into 'formal, meaningful, unit-groups' by a process for which the translator has coined the term 'Morphepoiesis' (though 'morphopoiesis' would be preferable), which is shown to underlie cortical function throughout. The author then passes to consider other phases of motor and sensory activity in different parts of the central nervous system, thus laying the foundation for an approach to the central functions of the psyche, defined as 'consciousness,' 'impulse' and 'affectivity.' An erudite chapter deals with the evolution of the psyche, and is followed by a discussion of the question whether traces or 'remnants' of earlier psychical development can be discovered under the highest cultural strata of the individual (what he terms 'hyponoic' and 'hypobulic' mechanisms). There is much, naturally, of personality and reaction types to engage the attention of the reader, while a chapter on psychotherapy ends the book.

No one can study this contribution without benefit, or fail to appreciate its skilful and plausible attempt at the synthesis of mind and matter.

Professor Kretschmer, as those who know his work on hysteria are aware, is one of the few who have essayed the task of discovering how a 'desire for compensation' is converted into a flaccid paralysis, or 'antagonism to a husband' into a tic; yet unless this aspect of conversion hysteria (so-called) is faced the psychopathologist has evoked more problems than his sexual theory has solved.

Dr. Strauss's introduction would perhaps be more persuasive did he not scold the nineteenth century for its alleged 'philosophical materialism' and what that is supposed to have entailed, and were a tendency to overstatement less pronounced among its paragraphs. His sanguine belief that the book will appeal to 'a very much wider public than that represented by the medical faculty' assumes that that public is as familiar with the technical terms of neurology and psychiatry as are those of the profession who have made these sciences their life-work.

Unfall und Hirngeschwulst. By Professor Dr. Otto Marburg, Vienna. With 12 illustrations. Vienna: Julius Springer. 1934. Pp. 106.

ANY contribution to the vexed question of trauma and brain tumour deserves close attention, for there are few subjects that have become more controversial in all countries where workmen's compensation is established. Professor Marburg opens his discussion of 'Das Problem' by roundly stating that thanks to the work of pathological anatomists it is 'absolut sicher' that tumours can be caused to develop by trauma. He remarks that older schools of neurologists firmly believed this, whereas the present generation seems to have become more sceptical; this is true, and it is good that it should be so. The distinguished author, however, proceeds to cite a number of statistics which declare that in such and such a percentage of brain tumours accident or injury was an antecedent—e.g. in about 10 per cent. of his own collection of 800. He then discusses seriatim a number of tumour types (glioma, meningioma, etc.), and provides a little précis of different cases from the literature, or of his own, illustrating the postulated connexion, amounting to some 141 in all.

No doubt this way of tackling the problem appears satisfactory to Professor Marburg and impressive to some among his readers; none the less it is inconclusive. In the first place, not a few among the cited examples are ambiguous, others inadequate, still others for one or other reason inappropriate. As a single instance Case 48 (p. 56) may be cited from Hübschmann: '48-year-old man; three months before death, fall down stairs; three weeks later, tumour symptoms; glioma.' This and similar cases can be made to prove anything—or nothing. In the second place, Professor Marburg, so far as we have observed, nowhere defines what he means by trauma; nor does he, seemingly, consider the cognate and all-important problem of whether trauma causes tumours outside the nervous system with the same ease and in at least as great a proportion. The 'shock' of trauma is not confined to nervous

tissues, even when it is the head that is struck ; then why not tumours of the scalp, for example, or, if a ' jolt ' is given to the chest or abdomen as well, of liver, lungs, and what not ? Professor Marburg is compelled to admit that the secret of ' traumatic ' pathogenesis is extraordinarily difficult. He discusses various theories of tumour growth, seeking to apply each in turn to the problem before him, but with ill success, though he clings to the view that in some at least of the gliomas fœtal or early infantile cells persist with potency of subsequent hyperplasia—that here and there in the nervous system germ material lies, capable of function. This material he supposes is separated by the action of trauma, but more is needed for its hyperplasia, and he conjectures that ' hormonal ' and ' anabolic ' factors also come into play.

Be all this as it may, with his final conclusion there will be general agreement, viz. that each case has to be considered on its merits, that all ' Momente ' have to be examined, and that experiment must be used to facilitate the decision. What, then, of the unique and colossal experiment of the War ?

Aufbau und Abbau der Grosshirnleistungen und ihre anatomischen Grundlagen. By Professor Dr. Max de Crinis. With 15 illustrations. Berlin : S. Karger. 1934. Pp. 95. Price RM 7.80.

For the English neurologist imbued with Jacksonian tradition there is little perhaps that is strikingly novel in this slender brochure, dealing as it does with the evolution and involution of the brain and its functions. Professor de Crinis places in juxtaposition a series of photographs of the cerebral cortex representing the anatomical changes that go on from birth to adult life, and shows in what these essentially consist. Maturation of the cell can be recognized by certain features, and the succession of modifications corresponds to evolution of function. Differences between cortical areas are conditioned not merely by cell structure (cytoarchitectonics) but by cell maturation, temporary though they may be in the latter respect. Involution of cortical function is considered on the wide basis of agnosia and apraxia, of aphasia and amusia ; it is worth passing note how this division of cerebral malfunction into agnosia and apraxia, long advocated by a few, and at one time severely criticized by Sir Henry Head, is becoming more popular and more firmly established. Professor de Crinis follows Wernicke's teaching to some extent, overschematized though it be. His description of aphasia and amusia has its value, and some of the varieties are illustrated by clinicopathological examples. He is rather enamoured of the ' kinetic melody ' (Monakow's term) of the cortex, and while he does not fail to show to what extent the brain works as a whole he is evidently no partisan of the view that cerebral localization has been overdone and has lost its significance. On the contrary, he cites with approval Kleist's useful differentiation of function in the visual and paravisual cortex, and that of others as well.

T

The Biology of the Individual. Vol. XIV. of Publications by the Association for Research in Nervous and Mental Disease. Baltimore: Williams & Wilkins Co. London: Baillière, Tindall and Cox. 1934. Pp. 323. Price 27s.

THE outstanding impression left on perusal of this latest volume in the Association for Research in Nervous and Mental Disease series is perhaps one of complete uncertainty as to the basis of constitution and personality, of grave doubt as to the existence of the much vaunted 'reaction types' of mankind. Some of the contributors to the discussions asserted that the individual's constitution is changing all the time, 'with each week or day or decade,' just as his chemical constitution is averred to be constantly altering. Others claimed the reverse. The 'typology' of the moment seems to be rocking on an insecure foundation; the 'athletic' type of Kretschmer is now regarded as a combination of other types and not one per se, while difficulties of classifying individual examples are freely admitted. As for the 'eidetic' type, Dr. Heinrich Kluver, who has devoted much study to the matter, wonders whether its subtypes are 'more than an interesting speculation,' and says 'the work done so far has not established definitely the existence of these biotypes.' This general impression is heightened by a glance through Dr. Smith Ely Jelliffe's historical introduction, where we learn of the 'incurable confusion' in respect of the concepts of 'constitution,' 'disposition,' and the like. Whether 'constitution' is inherited, or acquired, whether it is changeable or 'influenceable,' whether it is a morphological, physiological, cellular, or humoral-pathological conception, whether departure therefrom in the case of a given subject signifies a harmless variation or a degeneration—these and other matters are lightly touched on by Dr. Jelliffe, and leave the reader more in doubt than ever. He himself confesses to the adoption of a 'Puckian attitude' towards such discord of opinion, and remarks 'it is no wonder to hear the cry of the benevolent sceptic: "Back to Hippocrates!"'

What emerges from this welter of disagreement must surely be of value, viz. the fact that the goal of 'certainty' is not merely far off but perhaps fantastic.

The Neural Basis of Thought. By George G. Campion and Sir Grafton Elliot Smith, F.R.S., Professor of Anatomy in University College, London. London: Kegan Paul. 1934. Pp. 167. Price 9s.

BRIEFLY put, the thesis advanced in this joint work is that the continuity of trains of thought in the mind has its neural correlates in continuity of neural impulse to and fro from thalami to cortex and vice versâ 'along the multitudinous thalamocortical and corticothalamic paths in the thalamic fan or radiation.' The hypothesis is based, avowedly, on the views of Head and his coadjutors as to the functions of the thalamus, and assumes that the affective aspects of consciousness are related to thalamic activity—in other words, that thalamic function is 'conscious.' In so far as this theory asserts that

thalamic activity is concerned with the affective and cortical activity with the cognitive side of mentation it has no claim to novelty; not merely the thalamus but various parathalamic mechanisms, e.g. those of the hypothalamus, are involved in emotional experience and expression, as is generally admitted. On the other hand, certain lines of evidence go to show that affective experience and its expression have some at least of their substrata also in the cortex itself. No proof has been adduced, for example, that the clinical phenomena of Witzelsucht are connected with the essential organ of the thalamus; Nothnagel's syndrome is related to extrathalamic paths; rire and pleurer spasmodiques occur in consequence of lesions at various places not all of which interfere with thalamic action. As for the question whether thalamic activity is 'conscious' the argument against that view offered by Graham Brown might have been noted by the authors.

In a general way, it has long been realized that periventricular cell-fibre systems have to do with emotional and cortical with intellectual experience; their interassociation, however, and indeed that of all brain mechanisms, is so intimate that we may doubt whether such an allocation is not so schematic as to tend to mislead. Mr. Campion fully realizes this, laying stress on the interaction of the autonomic with the cerebrospinal nervous system and on the effects which are continually being produced by the influence of these two systems on one another. His view that the cortex does not 'inhibit' the thalamus is one to which others have been led; that there should be 'circulation' of neural impulse between thalamus and cortex is more in accordance with certain clinical data. But the problem is only part of a still wider one, viz. the relation in action of different levels of the central nervous system, and the real nature of so-called inhibition.

Neurology. By R. R. Grinker, Associate Professor of Neurology, University of Chicago. London: Baillière, Tindall and Cox. 1934. Pp. 979. Price 38s.

It is a serious undertaking in these days to write a long, full, and readable account of neurology—connoting thereby not merely nervous disease in the narrower sense, but also neuroanatomy, neurophysiology, and neuropathology. Dr. Grinker has completed his task in a satisfactory way. He provides descriptions of both syndromes and diseases, grouping them sometimes in accordance with their ætiology, at others on a clinical basis. Thus there are chapters on 'The Atrophies,' on 'Headaches,' 'The Epilepsies,' and the like; others are devoted to 'Syphilis of the Nervous System,' 'Trauma of the Central Nervous System,' 'Primary Infections of the Central Nervous System,' and so forth. Again, some anatomical division is selected—e.g. cerebellum, cranial nerves, cerebral cortex—and under each of these is furnished an account of anatomy, physiology, and symptomatology. The reader will note that, considered as a whole, the author's subject-matter is confined to what some term, rather badly, organic neurology; little or nothing is said, except casually, of such motor disturbances as tics, occupation

neuroses, habit-movements of childhood, etc., of hysteria, neurasthenia and other allied 'functional' states, of enuresis and other disorders with which the neurologist is familiar. On the other hand, the nervous symptoms of a variety of 'blood dyscrasias' receive considerable attention.

The book bears the marks of extensive reading, and may be considered up-to-date in its outlook. It is well illustrated and indexed. The style of writing leaves much to be desired in view of the ambitious character of the work, and there are indications that parts have been composed in more or less of a hurry, and of careless reading of proofs.

The Neurotic and his Friends. By R. G. Gordon, M.D., Physician, Royal United Hospital, Bath, etc. London: Methuen & Co. 1934. Pp. 87. Price 2s. 6d.

THIS booklet can be put with safety into the hands of the neurotic who wants to know what underlies his troubles, and be perused with benefit by his friends, who, as is rightly stressed, may have to live with him and perforce deal with his eccentricities before these compel resort to professional advice—if, indeed, they should do so at all. In simple language, brightened by adept use of simile or other illustration, Dr. Gordon has set down the causes of neurosis, its symptoms, and its treatment—technical and lay alike. He shows how neurosis may be initiated by one or other of life's 'crises,' by lack of guidance at appropriate moments, by ill-considered remark or action. In other words, the neurotic is in part at least pushed into his neurosis from without, however definite the flight thereto from within. The counsels here advocated are wise and humane, especially when they are based on good common sense. Life for the neurotic is not easy; it can be rendered less difficult if his entourage will ponder and inwardly digest the elementary truths here inculcated.

Il Liquido Cefalo-rachidiano in Biologica e in Terapia. By Professor Fidele Negro, Turin. Milan: Istituto Sieroterapico Milanese. 1934. Pp. 204.

THE starting point of the investigations recounted in Professor Negro's monograph was an experience of his father's, the late Professor Camille Negro, who had care of a patient suffering from spinal tumour. At operation for some reason or other the spinal dura mater was not stitched up, and a fistula resulted, through which leaked cerebrospinal fluid in abundance to the day of the patient's death, about three weeks later. He was observed to become steadily thinner and emaciated, and when his end was reached he was almost mummified. The author has made a long series of experiments with a view to studying this apparent trophic action of the spinal fluid. The protocols are given at length. Briefly, he has found that the animal which steadily loses its fluid soon becomes 'skin and bone'; conversely, parenteral injection of spinal fluid (3 c.cm. at intervals of a few days) enables the animal to put on

weight with some rapidity. The next step was to experiment on man; daily injection of 19 c.cm. in a series of asthenic cases of different kinds was followed by steady and at times astonishing improvement. A full description is supplied of the types of case treated, numbering 295 in all; they included cases of diabetes insipidus, myasthenia, asthenia of various sorts, senile marasmus, postencephalitic cachexia, infantile dystrophies, menstrual and menopausal disorders, nocturnal enuresis, etc.

Professor Negro advances evidence to suggest that into the spinal fluid pass the secretions or hormones of pituitary, pineal, choroid plexuses, ependyma and neural tissues, and to these he attributes the therapeutic value of injections of the fluid.

In view of the large amount of clinical material treated with apparent success the method merits further trial; it is stated to have no disadvantages or inconveniences.

The Patient and the Weather. By William F. Petersen, M.D. Vol. III.: Mental and Nervous Diseases. Ann Arbor: Edwards Brothers, Inc. 1934. Pp. 375.

THE author of this compilation, which represents only one-third of his studies, has taken for his theme the bearing of climatic conditions on the individual's life, growth, sensitiveness, resistance to disease—indeed, on his existence from the moment of conception. He has, for example, sought to correlate month of birth with subsequent mental distinction, alleging that from his collected data it looks as though persons with 'superior mental capacity' are more often conceived in spring, for 'the cellular instability of the disturbed seasons of the year makes more probable deviation from the normal.' He also examines at some length the topic of psychiatric episodes and meteorological background, illustrating his subject by a number of clinical cases, and is led to the conclusion that the 'insane individual is obviously a cosmic resonator.' The observation that people are affected by the weather is as old as the hills, but to have careful comparisons and correlations of symptoms and fluctuating climatic environment, such as are here conducted, is rather impressive. To the objection that the author is exalting extrinsic at the expense of intrinsic factors he replies that a 'series of forces' are at work, but that since the matter of weather is commonplace it is constantly overlooked.

The book is 'lithoprinted' in typescript largely for purposes of cheapness; the print is clear though unfamiliar.

Nutrition and Disease. By Edward Mellanby, M.D., F.R.S., late Professor of Pharmacology, University of Sheffield. Edinburgh and London: Oliver and Boyd. 1934. Pp. 171. Price 8s. 6d.

THE part of Dr. Mellanby's Croonian Lectures (here reprinted and amplified) that will appeal to the neurologist is that dealing with nutritional influences

acting on the nervous system. Personal experiments convinced Dr. Mellanby that demyelination of nerve-fibres occurred in young dogs deprived of fat-soluble vitamins, and that the degeneration can be prevented by the exhibition of vitamin A. He studied further the vulnerability of different sets and kinds of nerves in this regard, and also that of the central nervous system, noting lesions in dorsal root ganglia and corresponding ganglia in the brain, in Clarke's column and other dorsal horn cells, in dentate nucleus and Purkinje cells, in the vestibular division of the eighth, also in the fifth and second. He alludes to clinical evidence suggesting that vitamin A deficiency is one of the causes of retrobulbar neuritis in man. The next division of his subject consists in the application of experimental results to a series of clinical disease-conditions, e.g. pellagra, beriberi, subacute combined degeneration, ergotism, lathyrism, disseminated sclerosis. From diverse sources Dr. Mellanby collects a large number of observational data bearing on the general problem, sifts and evaluates them, and concludes that both vitamin A and vitamin B_1 enact a rôle in respect of some of these, but that other dietetic factors may be responsible as well, that not all their ætiologies are identical, and that the whole evidence needs strengthening.

The tentative nature of his studies is acknowledged ; none the less they are both stimulating and encouraging, and possess definite heuristic value.

The Influence of Heredity on Disease. By Lionel S. Penrose, M.A., M.D. London : H. K. Lewis. 1934. Pp. 80. Price 5s. net.

THIS essay on human genetics was awarded the Buckston Browne Prize in 1933. It provides, in brief compass, an account of present-day research along genetic lines in respect of a variety of diseases, together with instances of genetical analysis and the conclusions to be drawn therefrom. Those who desire to familiarize themselves with genetic concepts will find what is wanted in this unpretentious booklet, while all who read it can learn the best methods for studying family histories, and become instructed in the tests employed to-day. It has the advantage of never becoming too mathematical for ordinary medical intelligence.

Recent Advances in Neurology. By W. Russell Brain, D.M., Physician to the London Hospital, etc., and E. B. Strauss, D.M., Assistant Physician to the Cassel Hospital for Functional Nervous Disorders, etc. Third Edition. London : J. & A. Churchill. 1934. Pp. 442. Price 15s.

THOUGH but slightly altered in size from its predecessor, this new edition has been to a considerable extent rewritten, and while fresh material has been embodied therein little has been sacrificed. Much attention is vouchsafed to infective conditions in the nervous system, as this is one of the subjects that continues to attract notice and study, and to applied neurophysiology in respect of the hypothalamus. On previous occasions we have

recommended this compendium of current neurology to our readers and do so once more cordially.

L'Œuvre Scientifique de J. Babinski. Edited by a number of his pupils, collaborators, and friends. With 69 illustrations. Paris : Masson et Cie. 1934. Pp. 640. Price 180 fr.

NEUROLOGISTS the world over are deeply indebted to those of their French confrères who have executed a labour of love in selecting a large number of the scientific contributions of their famous countryman for his memorial. These have been reprinted in a handsome volume, where will be found many papers that will be always associated in the mind with their author—papers on which his great reputation rests securely. To turn these pages and come across old and well-known studies, e.g., those on hysteria, on the differential diagnosis between functional and organic hemiplegia, on cerebellar asynergy and others that might be particularized, is a treat for the reader ; and when at the same time he can recall the fine features and hear again the voice of the Maître his feelings become too deep for expression. A personal bibliography of some 288 titles exemplifies the labours of one of those to whom neurology will ever owe much of its attainment.

L'Angiographie Cérébrale. By Professor Egas Moniz, Professor of Neurology in the Faculty of Medicine of Lisbon. With 192 original figures. Paris : Masson et Cie. 1934. Pp. 327. Price 90 fr.

SINCE 1927 Professor Moniz of Lisbon has been indefatigable in advancing the art of cerebral angiography by means of injection into the carotid of substances opaque to X-ray, and more than 100 personal papers in medical journals testify to the fact. In 1931 he published a volume on the subject [see this JOURNAL, Vol. X., p. 91], and the one now under review, with virtually the same title, embodies the results of further knowledge obtained during the last three years. We are now shown how it is possible to get photographs of the cerebral venous system as well, and also what the state of the arterial tree is in numerous pathological conditions, e.g. hydrocephalus. The value of the method in cases of otherwise obscure cerebral tumours has been amply proved ; indeed, angiography has now taken its place among the accepted diagnostic techniques of the day.

Professor Moniz deserves all credit for the meritorious way in which he has prosecuted his researches, which cast light on various points of general anatomical and physiological interest. For example, he has observed that his opaque substance (thorotrast) disappears much more quickly from the cerebral circulation than from that of other parts which nevertheless are equidistant from the heart. Here lies a matter inviting more study. The book is excellently illustrated.

Illustrations of Regional Anatomy. Section I.: Central Nervous System (containing 48 Plates). By E. B. Jamieson, M.D., Senior Lecturer, Anatomy Department, University of Edinburgh. Edinburgh: E. and S. Livingstone. 1934. Price 7s.

THE Edinburgh School of Medicine has always been famous for its teaching and for aids thereto combining simplicity and accuracy. The fine series of moderately sized plates in Dr. Jamieson's 'Illustrations' represent admirably the gross anatomy of the brain and cord; partly coloured, the paper on which they are printed will take coloured chalks as well, which the student can use and so fix the structures in his memory. The nomenclature is that approved by the Anatomical Society of Great Britain and Ireland (1933). The plates are easily detachable and can be pasted into books or employed in other fashion. They are clearly drawn and well reproduced.

In Plate VI we consider it would be an advantage not to limit the 'psychosensory' field to the postcentral gyrus but to include at least the superior parietal lobule, where the function of stereognosis is principally placed; likewise, we think the 'psychoauditory' field too restricted in view of disorders associated with other parts of the temporal lobe than the superior temporal convolution. In Plate XXXIXB the position of the central section of the cervical sympathetic in the formatio reticularis might be indicated with advantage. More than one transverse section of the cord (only the cervical being given) might be supplied, since, for example, Clarke's column and the intermediolateral tract of the lateral horn are not figured.

La Syphilis du Cervelet. By J. Thiers, formerly Chef de Clinique at the Faculty of Medicine, Paris. With 10 figures. Paris: Gaston Doin. 1934. Pp. 104. Price 20 fr.

SYPHILIS of the cerebellum cannot differ in any noteworthy degree from cerebral syphilis of a wider kind; such features as it possesses depend mainly if not solely on its localization. M. Thiers divides his topic into vascular disorders, gummas, cerebellar syndromes of other forms of neurosyphilis, and cerebellar atrophies. He has written a useful little compendium of his subject.

History of the University of Edinburgh, 1883–1933. Edited on behalf of the History Committee by A. Logan Turner, M.D., LL.D., F.R.C.S. Edin. Edinburgh: Oliver and Boyd. 1934. Pp. 452. Price 10s. net.

ALL former students of Edinburgh University will be delighted with this history of their Alma Mater during the eventful 50 years preceding 1933. Though the Editor deals properly with all the faculties, it is his account of the faculty of medicine that will naturally appeal to medical graduates. Here will be found a deeply interesting description of the changes and

expansions that have marked that period, with concise yet charming notices of the illustrious figures with whose names the glory of the University is linked.

La Ponction Cisternale. By M. R. Castex, Rector of the University of Buenos Aires, and L. E. Ontaneda, Military Central Hospital, Buenos Aires. Translated by Dr. Gaullieur L'Hardy. With 5 coloured plates and 17 figures. Paris: Gaston Doin. 1934. Pp. 70. Price 35 fr.

THIS brochure of 70 pages contains all that need be known of the anatomy of the cisterna magna, and of the technique of cisternal or suboccipital puncture. Drawings and photographs, and good textual description, combine to make it simple and practical for the beginner to master the art of this variety of clinical procedure, whose value is not now likely to be underrated. The authors give in fullest detail their personal method, for which they utilize the bi-mastoid line. Dangers, risks, and inconveniences are all annotated, and a concise account supplied of present-day medication by the cisternal route.

Zur Psychopathologie und Klinik der Angstzustände. By Dr. G. E. Störring, University of Munich. Berlin: S. Karger. 1934. Pp. 117. Price RM 7.80.

DR. STÖRRING'S excellent study of anxiety states is concerned principally with their development in the course of psychical syndromes such as schizophrenia, melancholia, paranoia, hypochondriasis and so on; less attention is paid to their occurrence outside the psychoses. It is true a section is allotted to 'pure' conditions of pathological anxiety, but little or nothing is said of their episodic appearance in connexion with organic disease, nervous or otherwise, or of their relation to epilepsy. A distinction is drawn between anxiety and fright, also between 'mental' and 'somatic' forms; and a chapter at the end discusses 'anankastic' or compulsory anxiety, with its correlates of compulsory thinking and action. In this latter division a few lines allude to the condition as it occurs in postencephalitic oculogyric crises. References to German literature are ample, but no regard is paid to the work of Gowers and other English students of the subject—little enough, too, to that of Freud.

O Reflexo Cremasterico: Sua Dissociaçao nas Molestias Nervosas. By Dr. J. da Fonseca Bicudo Junior. Sao Paulo: Empresa Grafica. 1934. Pp. 259.

THIS thesis is based on the study of the cremasteric reflex in 170 cases and sets forth conclusions of some interest. In normal persons two reflexes can be demonstrated—that caused by contraction of the cremaster muscle itself, and that due to contraction of the lower part of obliquus internus. The former is

much more easy to observe than the latter. Further, the cremaster reflex itself consists of two forms; the 'superficial,' which is dependent on or at least closely related to the state of tactile sensibility, and the 'deep,' which is contingent on deep and in particular on visceral sensibility. The former is evoked by excitation of the skin on the upper and inner part of the thigh; the latter, by firm pressure over Hunter's canal, the adductor tubercle, or, preferably, at the apex of the triangle formed by sartorius and gracilis. Both are found normally and are subject to fewer interferences than the abdominal. In tabes the deep cremasteric often disappears before the superficial; the reverse is met with in peripheral neuritis of cutaneous nerves.

Occasional Notes

SECOND INTERNATIONAL NEUROLOGICAL CONGRESS, LONDON, 1935

July 29th to August 2nd

PRESIDENT:

Dr. Gordon Holmes, 9 Wimpole Street, London, W.1

VICE-PRESIDENTS:

Prof. A. Austregesilo (*Brazil*).
Prof. M. Balado (*Argentine*).
Prof. B. Brouwer (*Holland*).
Prof. V. Christiansen (*Denmark*).
Prof. H. Claude (*France*).
Prof. O. Foerster (*Germany*).
Prof. L. Haskovec (*Czechoslovakia*).
Prof. Ken Kuré (*Japan*).
Prof. M. Kroll (*U.S.S.R.*).
Prof. G. Lafora (*Spain*).
Prof. A. Ley (*Belgium*).
Prof. O. Marburg (*Austria*).
Prof. C. Parhon (*Roumania*).
Prof. E. Moniz (*Portugal*).
Prof. G. Monrad-Krohn (*Norway*).
Prof. K. Orzechowski (*Poland*).
Prof. H. A. Riley (*U.S.A.*).
Prof. O. Rossi (*Italy*).
Prof. C. K. Russel (*Canada*).
Prof. K. Schaffer (*Hungary*).

SECRETARIES:

Secretary-General . . Dr. Kinnier Wilson, 14 Harley Street, London, W.1.

Assistant Secretaries . Dr. Macdonald Critchley, 137 Harley Street, London, W.1.

Dr. E. A. Carmichael, National Hospital, Queen Square, London, W.C.1.

TREASURER:

Dr. Anthony Feiling, 52 Montagu Square, London, W.1.

THE SECOND INTERNATIONAL NEUROLOGICAL CONGRESS will be held in London from Monday, July 29, to Friday, August 2, 1935, under the Presidency of Dr. GORDON HOLMES. At the Programme Executive Conference held in London in 1933 Sir Charles Sherrington was elected President by the assembled delegates, but since then he has been regrettably compelled to resign for reasons connected with his health.

PLACE OF MEETING

The various sessions of the Congress will be held in the large hall of University College, Gower Street, W.C.1 (by kind permission of the Provost, Prof. Dr. Allen Mawer), and in lecture rooms of the College.

PROGRAMME OF SCIENTIFIC SESSIONS

MONDAY, JULY 29.

9.30 a.m.—Official Opening of the Congress.

10.0 a.m.—*Discussion : The Epilepsies—their Ætiology, Pathogenesis, and Treatment.* Chairman : Prof. O. MARBURG.

2.0 p.m.—Continuation of the Discussion. Chairman : Prof. O. ROSSI.

TUESDAY, JULY 30.

9.30 a.m.—*Discussion : The Physiology and Pathology of the Cerebrospinal Fluid.* Chairman : Prof. O. FOERSTER.

2.0 p.m.—Miscellaneous Papers.

THURSDAY, AUGUST 1.

9.30 a.m.—*Discussion : The Functions of the Frontal Lobe.* Chairman : Prof. H. CLAUDE.

2.0 p.m.—Miscellaneous Papers.

FRIDAY, AUGUST 2.

9.30 a.m.—*Discussion : The Hypothalamus and the Central Representation of the Autonomic System.* Chairman : Prof. B. BROUWER.

2.0 p.m.—Miscellaneous Papers.

The names and subjects of the various rapporteurs who will take part in the four Discussions for the Morning Sessions are as follows :

MONDAY, JULY 29. *The Epilepsies—their Ætiology, Pathogenesis and Treatment.*

1. Prof. Dr. J. ABADIE (Bordeaux) : General Ætiology of Epilepsy.
2. Prof. Dr. V. M. BUSCAINO (Catania) : Special Ætiology of Epilepsy.
3. Dr. STANLEY COBB (Boston) : Experimental Pathogenesis of Epilepsy.
4. Prof. E. A. SPIEGEL and MONA SPIEGEL (Philadelphia); Physico-chemical Factors in Convulsive Reactivity.
5. Dr. FRISCH (Austria) : Chemical Pathogenesis of Epilepsy.
6. Prof. Dr. K. ORZECHOWSKI (Warsaw) : The Vegetative Nervous System in Relation to Pathogenesis.
7. Prof. Dr. W. SPIELMEYER (Munich) : Pathological Anatomy of Epilepsy.
8. Dr. A. ULRICH (Zurich) : Medical Therapy.
9. Dr. WILDER PENFIELD (Montreal) : Surgical Therapy.
10. Dr. M. SGALITZER (Vienna) : X-ray Therapy.
11. Dr. L. J. J. MUSKENS (Amsterdam) : Institutional and General Treatment.

TUESDAY, JULY 30. *The Physiology and Pathology of the Cerebrospinal Fluid.*

1. Dr. L. WEED (Baltimore) : Physiology of Secretion and Resorption of the Cerebrospinal Fluid.

2. Dr. G. SCHALTENBRAND (Hamburg): Physiology of Secretion and Resorption and its Anatomical Basis.
3. Dr. RISER (Toulouse): Pathology of Secretion and Resorption.
4. Mr. HUGH CAIRNS (London): Therapeutic Procedures against Disturbances of Secretion and Resorption.
5. Prof. Dr. F. GEORGI (Yverdon): Physicochemical Basis of Secretion and Resorption.

THURSDAY, AUGUST 1. *The Functions of the Frontal Lobes.*

1. Prof. Dr. J. A. BARRÉ (Strasbourg) and Prof. Dr. P. DELMAS-MARSALET (Bordeaux): The Relation of the Functions of the Frontal Lobes to Manifestations of Cerebellar or Labyrinthine Type.
2. Prof. Dr. KURT GOLDSTEIN: The Relations between the Frontal Lobes and Motor Functions.
3. Prof. Dr. A. DONAGGIO (Modena): The Relations of the Frontal Lobes with the Pyramidal System.
4. Dr. CLOVIS VINCENT (Paris): Modifications of Function Observed after Surgical Intervention on the Frontal Lobes.

FRIDAY, AUGUST 2. *The Hypothalamus and the Central Representation of the Autonomic System.*

1. Prof. Dr. C. U. ARIËNS CAPPERS (Amsterdam): Phylogenetic Development.
2. Prof. LE GROS CLARK (Oxford): The Ontogenetic Development and Normal Conditions in Man.
3. Prof. Dr. W. R. HESS (Zurich): Physiology.
4. Prof. Dr. J. LHERMITTE (Paris): Clinical and Pathological Aspects.
5. Dr. HARVEY CUSHING (New Haven): Surgery.

The number of Afternoon Sessions will be determined by the total number of papers offered and accepted. So far as practicable, these will be arranged in a systematic manner, under different headings.

HUGHLINGS JACKSON MEMORIAL LECTURE.—On Friday evening, August 2, at 8.30 p.m., the triennial Hughlings Jackson Memorial Lecture, under the auspices of the Section of Neurology of the Royal Society of Medicine, London, will be delivered by Prof. O. Foerster of Breslau. To this lecture all the Members of the Congress are cordially invited. The place of meeting will be announced later.

PROGRAMME OF RECEPTIONS

MONDAY, JULY 29.

9.0 p.m.—Official Reception of all the Members of the Congress, at a place to be announced later.

TUESDAY, JULY 30.

9.0 p.m.—Receptions by the President and Fellows of the Royal College of Physicians at their College, Pall Mall, S.W.1, and by the President and Fellows of the Royal College of Surgeons at their College, Lincoln's Inn Fields, W.C.2.

THURSDAY, AUGUST 1.

7.30 p.m.—Official Banquet of the Congress at Grosvenor House, Park Lane, W.1.

FRIDAY, AUGUST 2.

9.30 p.m.—After the delivery of the Hughlings Jackson Memorial Lecture, Reception by the Section of Neurology of the Royal Society of Medicine at a place to be announced later.

REGULATIONS FOR SCIENTIFIC SESSIONS

MORNING SESSIONS.—The Chairmen of the respective Morning Sessions have chosen the rapporteurs for the Discussions. Twenty minutes is the maximum time allowed for each rapporteur. After the rapporteurs have given their communications, discussion will be thrown open by the Chairman, each person taking part in it being allowed five minutes for his remarks.

Completed papers for the Morning Sessions must be in the hands of the Chairmen, or the Programme Committee, by April 1, 1935, at the latest.

> The PROGRAMME COMMITTEE is constituted by (1) the British Officers of the Congress, and (2) the Chairmen of the Morning Discussions. The Secretary-General, Dr. Kinnier Wilson, is the Secretary of this Programme Committee.

Abstracts of each paper read by rapporteurs at the Morning Session must be submitted to the Programme Committee for incorporation in the Official Congress Programme not later than April 1, 1935. These abstracts must be written in English, French or German.

In order to prevent overlapping, abstracts of contributions on the subject of a given Morning Discussion should be communicated as soon as possible to the other rapporteurs on that subject.

AFTERNOON SESSIONS.—The choice of Chairmen for the Afternoon Sessions will depend on the number of papers submitted and accepted and therefore on the number of sessions required. The Chairmen will be chosen (by the Programme Committee) from among the Vice-Presidents of the Congress, and the Chairmen may designate other distinguished Members of the Congress for the same purpose.

Not more than one contribution from any one Member of the Congress will be allowed, but Members may take part in any discussion, and any official rapporteur for any of the morning subjects may also present one other paper of a miscellaneous character.

The maximum time for presentation of a miscellaneous paper is ten minutes. There will be open discussion of each afternoon paper, each person taking part in it being allowed five minutes for his remarks. As far as possible the Programme Committee will arrange that papers of a similar character will be grouped together in one or other of the Afternoon Sessions.

Abstracts of all papers (or the papers themselves) submitted on miscellaneous subjects must be in the hands of the Programme Committee not later than April 1, 1935. In the case of papers presented in Italian or Spanish, the author must furnish an abstract of the same in either English, French, or German and submit it to the Programme Committee by the above-mentioned date.

MEMBERSHIP

ACTIVE MEMBERS.—All neurologists, neurosurgeons, psychiatrists, and any physicians or surgeons interested in neurology, may become Active Members of the Congress. Candidates for Active Membership may make application in one or other of two ways : either (i) through one of the National Committees, in which case their qualifications shall be examined by such National Committee, or (ii) by direct application to the Programme-Executive Committee through its Secretary, Dr. Kinnier Wilson, in which case their qualifications shall be examined by the Executive Committee. Membership cards for all Members of the Congress will be issued by the Secretary of the Congress and payments of subscriptions can be made either through the National Committees or direct to the Treasurer of the Congress.

ASSOCIATE MEMBERS.—Non-professional persons, men and women, who are interested in the Congress, may become Associate Members. They may do so by application either through the National Committee of their country, or directly through the Programme Executive Committee, i.e. by application to Dr. Kinnier Wilson, Secretary-General.

Membership cards will be issued in due course.

FEES FOR MEMBERSHIP.—At the Preliminary Programme Conference held in London in 1933 the subscription for each Active Member was fixed at 25 Swiss francs or its equivalent. For those in Great Britain and Ireland this has been taken by the Programme Executive Committee of the Congress to be equal to £1 10s. sterling, which amount, therefore, constitutes the fee for Active Membership for those who will pay it in sterling.

The subscription for each Associate Member is, similarly, fixed at the equivalent of one half of 25 Swiss francs, or 15s. sterling.

These subscriptions can be paid either through the National Committees or direct to the Treasurer of the Congress.

OFFICIAL LANGUAGES

The official languages of the Congress have been chosen by the Preliminary Programme Conference to include English, French, German, Italian and Spanish. Any Member who presents his communication in Italian or Spanish must send to the Programme Committee of the Congress an abstract of his paper in either English, French, or German not later than April 1, 1935. These abstracts are for publication in the Official Programme of the Congress.

TRAVEL AND HOTEL ACCOMMODATION

Messrs. Thos. Cook & Sons, Berkeley Square, London, W.1, are the official Travel Agents for the Congress. Their representatives in England and abroad are prepared to make all the necessary arrangements for members of the Congress who desire travelling facilities or hotel accommodation in London. The person in charge of these is Mr. P. McAuslan (Telephone : Grosvenor 4000 ; extension, 49), at Messrs. Thos. Cook & Son's head office, Berkeley Square, W.1.

ENTERTAINMENTS AND EXCURSIONS

For Wednesday, July 31, on which day there are no scientific sessions, a number of attractive excursions are being arranged, including, for example, visits to Oxford, Cambridge, Stratford-on-Avon, Windsor, Goodwood, etc. On the afternoon of other days excursions and entertainments are being arranged for the Associate Members of the Congress. Of all these due announcement will be made.

KINNIER WILSON,
Secretary-General.

14 HARLEY STREET,
LONDON, W.1.
January, 1935.